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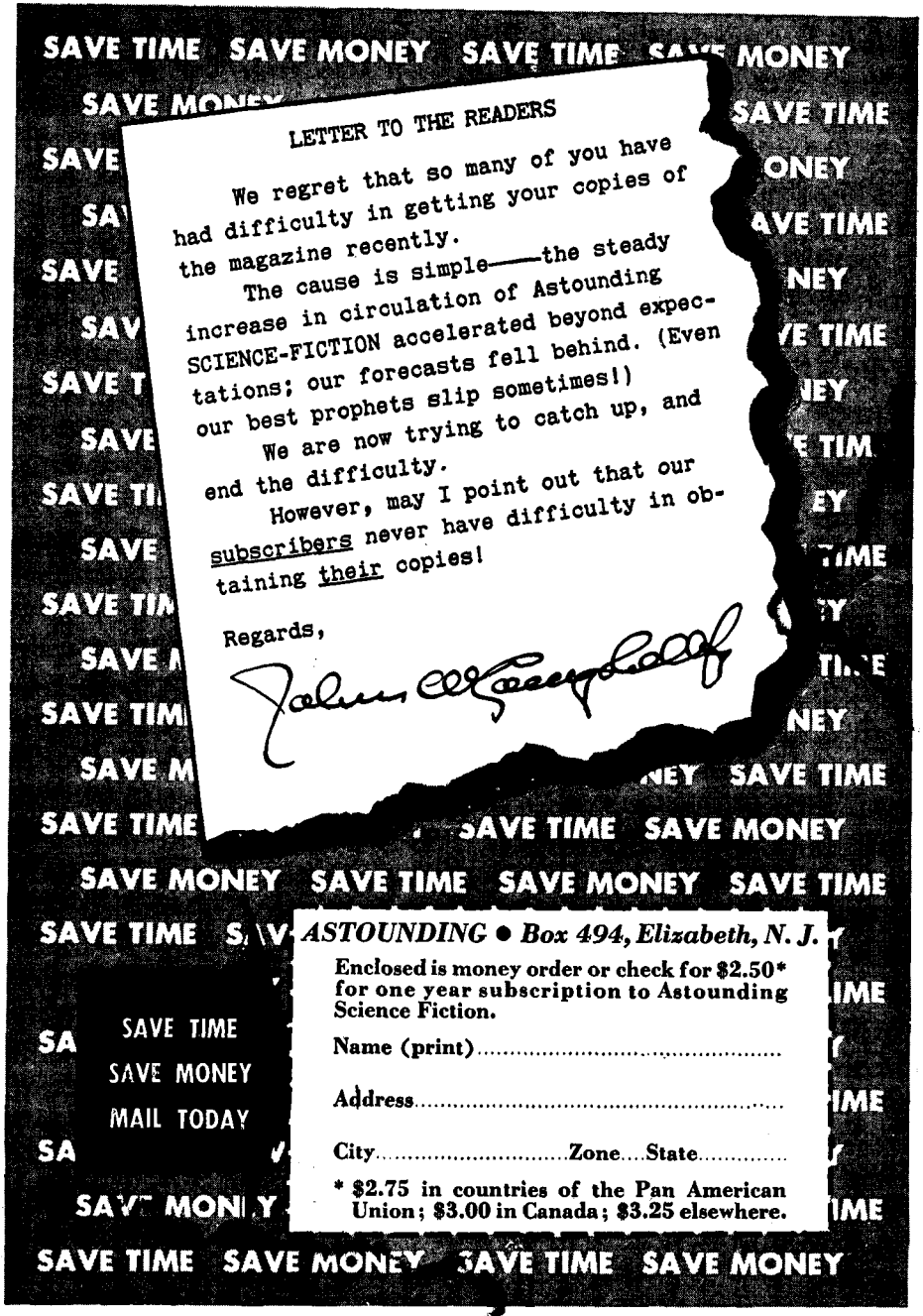

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Astounding
SCIENCE FICTION
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AST—1A

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EDUCATION

I suspect that many readers this month are looking forward to some sort of reaction to last month's article on dianetics. I'll start off by explaining that this is not a news magazine, and is not published on a high-speed schedule suited to news periodicals. At the time I write these words, the May issue is not yet bound; it will be thirty days before that issue reaches the stands. Reactions to the dianetics articles, and further articles on the subject, will appear, naturally—but it may be several months. Sorry—that's the way it is.

One phase of dianetics, however, is available for discussion and is of the greatest interest. There is plenty of time for argument on some of Hubbard's material, but the existence of photographic and phonographic memory is so readily and clearly demonstrable as to be accepted as a simple fact. That type of memory is the natural right of every normal human being. That such memory has been locked in the past is apparent; it's interesting to consider the implications of the realization that most children do possess and can use that type of memory—and the consequent implications for education.

At present, much of a child's early schooling is devoted to drilling into his memory such things as arithmetic, spelling, geography and the like. Languages—whether Latin or French or German—are simply memory work also, although it has been customary to start language courses at high school levels.

But if human memory is photographic and phonographic, the problem is not to engrave the data in the memory—but to learn the trick of recovering that data immediately when desired. In this view, spelling, arithmetic, geography and languages alike fall into one class—each is a sub-class of the more general class of Data-By-Definition. The letters C, A and T spell "cat" not by any reasoned, logical process, but solely because we have, by agreement, so defined the arrangement; "tough" and "though" certainly were not arrived at by reasoned processes; they can be accepted only as data-by-definition, by pure memory. Similarly two plus two equals four because we say so, and define four, two, and equals in such manner as

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to make that statement a simple formulation of the definition. And despite what Californians feel, California is not a law of nature, a natural phenomenon, or anything derivable from reasoned thought—it's a political definition. And certainly the value of "mesa" derives wholly from definition, not from logic. In English, its an upthrust plateau; in Spanish it's a table.

Learning such material, then, involves no more than memorizing a complex series of data and operational rules. That it requires no intellectual genius whatever is magnificently demonstrated by the success of one dollar adding machines that do arithmetic more quickly and accurately than most ten-year-old children. Punched-card machines can answer questions on geography, or translate words from one language to another. Evidently, these functions are nonintellectual, low-order stuff for a human mind.

The time spent training these, as separate subjects, into the mind might, evidently, be spent better in training the human mind to be able to *extract* the stored data—for it is easily shown that the data is stored immediately, the first time it is made available to the mind. This whole group of subjects, then, should be taught with the idea in mind that they are, in fact, sub-classes of the data-by-definition group — and the problem is teaching the mind to use its data-recall abilities.

On the other hand, many an honor pupil in grammar school falls extremely flat on his scholarly face when he reaches high school and such subjects as geometry and algebra reading problems. The most perfectly functioning memory will not solve the problem of a geometry original, no matter how efficient that memory has been as an arithmetic machine. A geometry original is beyond the powers of the best desk calculating machine, too. It requires something new—independent, logical thought.

Doing algebra reading problems, similarly, requires analytical thought. It demands the ability to recognize the relevant, necessary and sufficient data. Of course, modern high school reading problems are not particularly good tests—a good one would have at least twenty factors, seventeen of which were extraneous, nongermane, and more exciting than the three buried relevant facts. They might even be more useful, if they dealt with the laws of probability vs. the chance of lining up three lemons on a one-armed bandit.

The real province of education is defined in the derivation of the word —to lead out. The mind stores facts immediately and automatically. Education must teach it to lead out those facts at will, line them up in useful fashion, and learn to *think*.

What progress could be made in education if seventy-five percent of the time now spent on low-order memory work could be spent, instead, in training thinking?

THE EDITOR.

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INCOMMUNICADO

BY KATHERINE MACLEAN

***Knowledge** is vital to a technical culture—but communication of that knowledge, and its products, thoughts, is the essential link. And it seemed that the be-bop station had really gone out of this world!*

Illustrated by Miller

The solar system is not a gentle place. Ten misassorted centers of gigantic pulls and tensions, swinging around each other in ponderous accidental equilibrium, filling space with the violence of their silent battle. Among these giant forces the tiny ships of Earth were overmatched and weak. Few could spend power enough to climb back to space from the vortex of any planet's field, few dared approach closer than to the satellite spaceports.

Ambition always overreaches strength. There will always be a power shortage. Space became inhabited by underpowered private ships. In a hard school of sudden death new skills were learned. In understanding hands the violence of gravitation, heat, and cold, became sustenance, speed, and power. The knack of traveling was to fall, and fall without resistance, following a free line, using the precious fuel only for fractional changes of direction. To fall, to miss and "bounce" in a zigzag of carom shots—it was a good game for a pool shark, a good game for a handball addict, a pinball specialist, a kinetics expert.

"Kinetics expert" is what they called Cliff Baker.

At the sixth hour of the fourth week of Pluto Station project he than a fragment of tune which would had nothing more to worry about

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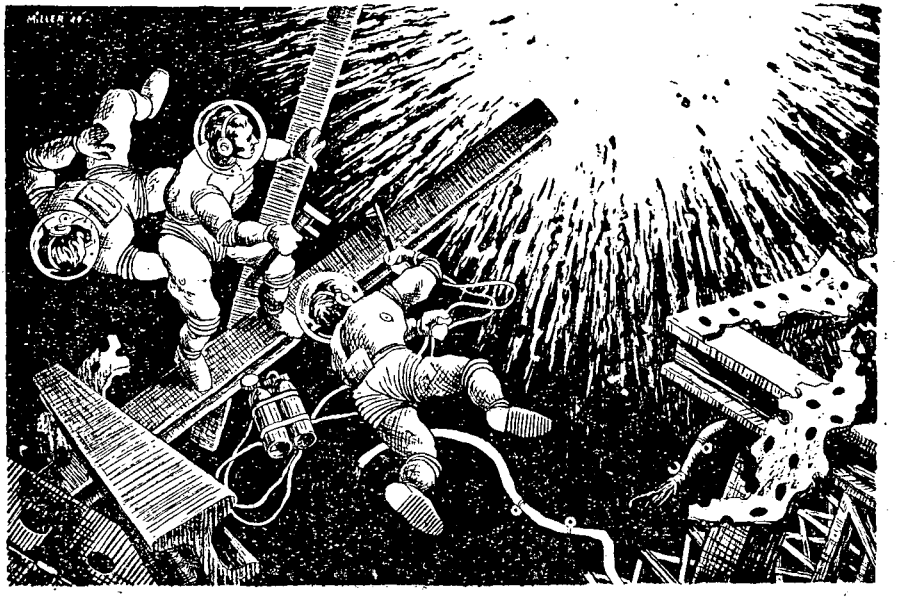

not finish itself. Cliff floated out of the master control room whistling softly and looking for something to do.

A snatch of Smitty's discordant voice raised in song came from a hatch as he passed. Cliff changed direction and dove through into the star-lit darkness of a glassite dome. A rubbery crossbar stopped him at the glowing control panel.

"Take a break, Smitty. Let me take over for a while."

"Hi, chief," said Smitty, his hands moving deftly at the panel. "Thanks. How come you can spare the time? Is the rest of the circus so smooth? No emergencies, everything on schedule?"

"Like clockwork," said Cliff. "Knock wood." He crossed fingers for luck and solemnly rapped his skull. "Take a half hour, but keep your earphones tuned in case something breaks."

"Sure." Smitty gave Cliff a slap on the shoulder and shoved off. "Watch yourself now. Look out for the psychologist." His laugh echoed back from the corridor.

Cliff laughed in answer. Obviously Smitty had seen the new movie, too. Ten minutes later when the psychologist came in, Cliff was still grinning. The movie had been laid in a deep-space construction project that was apparently intended to represent Pluto Station project, and it had been commanded by a movie version of Cliff and Mike; Cliff acted by a burly silent character carrying a heavy, unidentified tool, and Mike

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Cohen of the silver tongue by a handsome young actor in a wavy pale wig. In this version they were both bachelors and wasted much time in happy pursuit of a gorgeous blonde.

The blonde was supposed to be the visiting psychologist sent up by Spaceways. She was a master personality who could hypnotize with a glance, a sorceress who could produce mass hallucinations with a gesture. She wound up saving the Earth from Cliff. He was supposed to have been subtly and insanely disarranging the Pluto Station orbit, so that when it was finished it would leave Pluto and fall on Earth like a bomb.

Cliff had been watching the movie through an eyepiece-earphone rig during a rest period, but he laughed so much he fell out of his hammock and tangled himself in guide lines, and the others on the rest shift had given up trying to sleep and decided to play the movie on the big projector. They would be calling in on the earphones about it soon, kidding him.

He grinned, listening to the psychologist without subtracting from the speed and concentration of handling the control panel. Out in space before the ship, working as deftly as a distant pair of hands, the bulldog construction units unwrapped floating bundles of parts, spun, pulled, magnetized, fitted, welded, assembling another complex perfect segment of the huge Pluto Station.

"I'd like to get back to Earth," said the psychologist in a soft tenor voice that was faintly Irish, like a younger brother of Mike. "Look, Cliff, you're top man in this line. You can plot me a short cut, can't you?" The psychologist, Roy Pierce, was a slender dark Polynesian who seemed less than twenty years old. During his stay he had floated around watching with all the innocent awe of a tourist, and proved his profession only in an ingratiating skill with jokes. Yet he was extremely likable, and seemed familiar in some undefinable way as if one had known him all his life.

"Why not use the astrogator?" Cliff asked him mildly.

"Blast the astrogator! All it gives is courses that swing around the whole rim of the System and won't get me home for weeks!"

"It doesn't have to do that," Cliff said thoughtfully. The segment was finished. He set the controls of the bulldogs to guide it to the next working sector and turned around, lining up factors in his mind. "Why not stick around? Maybe someone will develop a split personality for you."

"My wife is having a baby," Pierce explained. "I promised I'd be there. Besides, I want to help educate it through the first year. There are certain things a baby can learn that make a difference later."

"Are you willing to spend four days in the acceleration tank just to go down and pester your poor kid?" Cliff floated over to a celestial sphere and idly spun it back and forth

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through the planetary positions of the month.

"Of course."

"O.K. I think I see a short cut. It's a little risky, and the astrogator is inhibited against risk. I'll tell you later."

"You're stalling," complained Pierce, yanking peevishly at a bending crossbar. "You're the expert who keeps the orbits of three thousand flying skew bodies tied in fancy knots, and here I want just a simple orbit for one little flitter. You could tell me now."

Cliff laughed. "You exaggerate, kid. I'm only half the expert, Mike is the other half. Like two halves of a stage horse. I can see a course that I could take myself, but it has to go on automatic tapes for you. Mike can tell me if he can make a computer see it, too. If he can, you'll leave in an hour."

Pierce brightened. "I'll go pack. Excuse me, Cliff."

As Pierce shoved off towards the hatch, Mike Cohen came in, wearing a spacesuit unzipped and flapping at the cuffs, talking as easily as if he had not stopped since the last conversation. "Did you see the new movie during rest shift, Cliff? That hulking lout who played yourself—" Mike smiled maliciously at Pierce as they passed in the semidark. "Hi, Kid. Speaking of acts, who were you this time?"

"Michael E. Cohen," said the youth, as he floated out. He looked back to see Mike's expression, and before shoving from sight added maliciously. "I always pick the character for whom my subject has developed the greatest shock tolerance."

"Ouch!" Mike murmured. "But I hope I have no such edged tongue as that." He gripped a crossbar and swung to a stop before Cliff. "The boy is a chameleon," he said, half admiringly. "But I wonder has he any personality of his own."

Cliff said flatly, "I like him."

Mike raised his villainous black eyebrows and spread his hands, a plaintive note coming into his voice. "Don't we all? It is his business to be liked. But who is it that we like? These mirror-trained sensitives—"

"He's a nice honest kid," Cliff said. Outside, the constructor units flew up to the dome and buzzed around in circles waiting for control. Another bundle of parts from the asteroid belt foundry began to float by. Hastily Cliff seized a pencil and scrawled a diagram on a sheet of paper, then returned to the controls. "He wants to go back to Earth. Could you tape that course? It cuts air for a sling turn at Venus."

An hour later Mike and Cliff escorted the psychologist to his ship and inserted the control tapes with words of fatherly advice.

Mike said cheerfully: "You will be running across uncharted space with no blinker buoys with the rocks, so you had better stay in the shock tank and pray."

And Cliff said cheerfully, "If you get off course below Mars, don't bother signaling for help. You're sunk."

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"You know, Cliff," Mike said, "too many people get cooked that way. Maybe we should do something."

"How about Mercury?"

"Just the thing, Cliff. Listen, Kid, don't worry. If you fall into the Sun, we'll build a rescue station on Mercury and name it after you."

A warning bell rang from the automatics, and the two pushed out through the air lock into space with Cliff protesting. "That's not it. About Mercury I meant—"

"Hear the man complaining," Mike interrupted. "And what would you do without me around to finish your sentences for you?"

Eight hours later Mike was dead.

Some pilot accidentally ran his ship out of the assigned lanes and left the ionized gas of his jets to drift across a sector of space where Mike and three assistants were setting up the nucleus of the station power plant.

They were binding in high velocities with fields that put a heavy drain on the power plants of distant ships. They were working behind schedule, working fast, and using space gaps for insulation.

When the ionized gas drifted in everything arced.

The busy engineers in all the ring of asteroids and metalwork that circled Pluto saw a distant flash that filled their earphones with a howl of static, and at the central power plants certain dials registered a sudden intolerable drain, and safety relays quietly cut off power from that sector. Binding fields vanished and circular velocities straightened out. As the intolerable blue flash faded, dull red pieces of metal bulleted out from the damaged sector and were lost in space. The remainder of the equipment began to drift in aimless collisions.

Quietly the emergency calls came into the earphones of all sleeping men, dragging them yawning from their hammocks to begin the long delicate job of charting and rebalancing the great assembly spiral.

One of the stray pieces charted was an eighty-foot asteroid nugget that Mike was known to have been working on. It was falling irrevocably towards Pluto. For a time a searchlight glinted over fused and twisted metal which had been equipment, but it came no closer and presently was switched out, leaving the asteroid to darkness.

The damage, when fully counted, was bad enough to require the rebalancing of the entire work schedule for the remaining months of the project: subtracting the work hours of four men and all work on the power plant that had been counted done; a rewriting of an intricate mathematical jigsaw puzzle of hours; skills; limited fuel and power factors; tools; and heavy parts coming up with inexorable inertia from the distant sunward orbits where they had been launched over a year ago.

No one took the accident too hard. They knew their job was dangerous, and were not surprised when some-

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times it demonstrated that point. After they had been working a while Cliff tried to explain something to Danny Orlando—Danny Orlando couldn't make out exactly what, for Cliff was having his usual amusing trouble with words. Danny laughed, and Cliff laughed and turned away, his heavy shoulders suddenly seeming stooped.

He gave only a few general directions after that, working rapidly while he talked over the phone as though trying to straighten everything singlehanded. He gave brief instructions on diverting the next swarm of parts and rocks coming up from the asteroid belt foundries, and then he swung his small tug in a pretzel loop around Pluto that tangented away from the planet in the opposite direction from Pluto's orbital swing. The ship was no longer in a solar orbit at balance, solar gravity gripped it smoothly and it began to fall in steady acceleration.

"Going to Station A," Cliff explained over the general phone before he fell out of beam range. "I'm in a hurry."

The scattered busy engineers nodded, remembering that as a good kinetics man Cliff could jockey a ship through the solar system at maximum speed. They did not wonder why he dared leave them without co-ordination, for every man of them was sure that in a pinch, maybe with the help of a few anti-sleep and think-quick tablets, he could fill Cliff's boots. They only wondered why he did not pick one of them to be his partner, or why he did not tape a fast course and send someone else for the man.

When he was out of beam range a solution was offered. "Survival of the fittest," said Smitty over the general phone. "Either you can keep track of everything at once or you can't. There is no halfway in this co-ordination game, and no one can help. My bet is that Cliff has just gone down to see his family, and when he gets back he'll pick the man he finds in charge."

They set to work, and only Cliff knew the growing disorder and desperation that would come. He knew the abilities of the men on his team—the physicists, the field warp specialists, the metallurgists. There was no one capable of doing co-ordination. Without perfect co-ordination the project could fall apart, blow up, kill.

And he was leaving them. Gross criminal negligence.

Manslaughter.

"Why did you leave the project?" Spaceways Commission would ask at the trial.

"I would be no use there." Not without Mike.

He sat in the stern of his ship in the control armchair and looked at the blend of dim lights and shadows that picked out the instrument panel and the narrow interior of the control dome. Automatically the mixture analyzed for him into overlapping spheres of light blending and reflecting from the three light

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sources. There was no effort to such knowledge. It was part of sight. He had always seen a confusion of river ripples as the measured reverberations of wind, rocks, and current. It seemed an easy illiterate talent, but for nineteen years it had bought him a place on Station A, privileged with the company of the top research men of Earth who were picked for the station staff as a research sinecure, men whose lightest talk was a running flame of ideas. The residence privilege was almost an automatic honor to the builder, but Cliff knew it was more of an honor than he deserved.

After this the others would know.

Why did you leave the project? Incompetence.

Cliff looked at his hands, front and back. Strong, clumsy, almost apelike hands that knew all the secrets of machinery by instinct, that knew the planets as well as if he had held them and set them spinning himself. If all the lights of the sky were to go out, or if he were blind he could still have cradled his ship in any spaceport in the system, but this was not enough. It was not skill as others knew skill, it was instinct, needing no learning. How hard to throw a coconut—how far to jump for the next branch—no words or numbers needed for that, but you can't tape automatics or give directions without words and numbers.

All he could give would be a laugh and another anecdote to swell the collection.

"Did you see Cliff trying to imitate six charged bodies in a submagnetic field?"

Sitting in the shock tank armchair of the tug, Cliff shut his eyes, remembered Brandy's remarks on borrowing trouble, and cutting tension cycles, and with an effort put the whole subject on ice, detaching it from emotions. It would come up later. He relaxed with a slightly lopsided grin. The only current problem was how to get Archy and himself back up to Pluto before the whole project blew up.

He left his ship behind him circling the anchorage asteroid at a distance and speed that broke all parking rules, but Cliff had made the rules, and he knew how much drain the anchorage projectors could take. They could hold the ship in for two hours, long enough for him to get Archy and tangent off again with all the ship momentum intact.

High speeds are meaningless in space, even to a lone man in a thin spacesuit. There was no sense of motion, and nothing in sight but unmoving stars, yet the polarized wiring of his suit encountered shells of faint resistance, shoves and a variety of hums; and Cliff did not need his eyes. He knew the electromagnetic patterns of the space around Station A better than he knew the control board of the tug. With the absent precision of long habit he touched the controls of his suit, tuning its wiring to draw power from the station carrier wave. As he tuned

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in, the carrier was being modulated by a worried voice.

"Can't quite make out your orbit. Would you like taxi service? Answer please. We have to clear you, you know."

Cliff wide-angled the beam of his phone and flashed it in the general direction of Station A for a brief blink of full power that raised it to scorching heat in his hand. The flash automatically carried his identification letters.

"Oh, is that *you,* Cliff? I was beginning to wonder if your ship were heaving a bomb at us. O.K. clear. The port is open." In the far distance before him a pinpoint of light appeared and expanded steadily to a great barrel of metal rotating on a hollow axis. With the absent-minded competence of a skier on a slope Cliff cut his speed, curved and went through the dark mouth of the axis. Inside, invisible forces matched his residual velocity to the station and deposited him gently in a storage locker.

Cliff passed through the ultraviolet and supersonic sterilizing stalls to the locker room, changed his sterilized spacesuit for clean white shorts, and stepped out onto the public corridors. They were unusually deserted, he managed to reach the library without exchanging more than a distant wave with someone passing far down a corridor.

There was someone in the reading room, but Cliff passed hurriedly, hoping the man would not turn and greet him or ask why he was there; or how was Mike— Hurriedly he shoved through a side door, and was in the tube banks and microfiles where the information service works, were open to Archy's constant tinkering.

There was a figure sitting cross-legged, checking some tubes, but it was not Archy. It was a stranger.

Cliff tapped the seated figure on the shoulder and extended a hand as the man turned. "My name is Cliff Baker. I'm one of the engineers of this joint. Can I be of any help to you?"

The man, a small friendly Amerind, leaped to his feet and took the hand in a wiry nervous clasp, smiling widely. He answered in Glot with a Spanish accent.

"Happy to meet you, sir. My name is McCrea. I am the new librarian to replace Dr. Reynolds."

"It's a good job," said Cliff. "Is Archy around?"

The new librarian gulped nervously. "Oh, yes, Dr. Reynolds' son. He withdrew his application for the position. Something about music I hear. I don't want to bother him. I am not used to the Reynolds' system, of course. It is hard to understand. It is sad that Dr. Reynolds left no diagrams. But I work hard, and soon I will understand." The little man gestured at his scattered tools and half drawn tentative diagrams, and gulped again. "I am not a real, a *genuine* station research person, of course. The commission they have honored me with is a temporary appointment while they—"

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Cliff had listened to the flow of words, stunned. "For the luvva Pete!" he exploded. "Do you mean to say that Archy Reynolds has left you stewing here trying to figure out the library system, and never raised a hand to help you? What's wrong with the kid?"

He smiled reassuringly at the anxious little workman. "Listen," he said gently. "He can spare you ten minutes. I'll get Archy up here if I have to break his neck."

He strode back into the deserted library, where one square stubborn man sat glowering at the visoplate of his desk. It was Dr. Brandias, the station medico.

"Ahoy, Brandy," said Cliff. "Where's Archy? Where is everybody anyhow!"

Brandy looked up with a start. "*Cliff*. They're all down in the gym, heavy level, listening to Archy give a jazz concert." He seemed younger and more alert, yet paradoxically more tense and worried than normal. He assessed Cliff's impatience and glanced smiling at his watch. "Hold your horses, it will be over any minute now. Spare me a second and show me what to do with this contraption." He indicated the reading desk. "It's driving me bats!" The intonations of his voice were slightly strange, and he tensed up self-consciously as if startled by their echo.

Cliff considered the desk. It sat there looking expensive and useful, its ground glass reading screen glowing mildly. It looked like an ordinary desk with a private microtape file and projector inside to run the microfilm books on the reading screen, but Cliff knew that it was one of Reynolds' special working desks, linked through the floor with the reference files of the library that held in a few cubic meters the incalculable store of all the Earth's libraries, linked by Doc Reynolds to the service automatics and the station computer with an elaborate control panel. It was comforting to Cliff that a desk should be equipped to do his calculating for him, record the results and photograph and play back any tentative notes he could make on any subject. Reynolds had made other connections and equipped his desks to do other things which Cliff had never bothered to figure out, but there was an irreverent rumor around that if your fingers slipped on the controls it would give you a ham sandwich.

"Cliff," Brandy was saying, "if you fix it, you're a life saver. I've just got the glimmering of a completely different way to control the sympathetic system and take negative tension cycles out of decision and judgment sets, and—"

Cliff interrupted with a laugh, "You're talking out of my frequency. What's wrong with the desk?"

"It won't give me the films I want," Brandy said indignantly. "Look, I'll show you." The doctor consulted a list of decimal index numbers on a note pad, and rapidly

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punched them into the keyboard. As he did so the board gave out a trill of flutelike notes that ran up and down the scale like musical morse. "And all that noise—" Brandy grumbled. "Doc kept turning it up louder and louder as he got deafer and deafer before he died. Why doesn't somebody turn it down?" He finished and pushed the total key to the accompaniment of a sudden simultaneous jangle of notes. The jangle moved into a high twittering, broke into chords and trailed off in a single high faint note that somehow seemed as positive and final as the last note of a tune.

Cliff ignored it. All of Reynolds' automatic ran on a frequency discrimination system, and Doc Reynolds had liked to hetrodyne them down to audible range so as to keep track of their workings. Every telephone and servo in the station worked to the tune of sounds like a chorus of canaries, and the people of the station had grown so used to the sound that they no longer heard it. He looked the panel over again.

"You have the triangulation key in," he told Brandias, and laughed shortly. "The computer is taking the numbers as a question, and it's trying to give you an answer."

"Sounds like a Frankenstein," Brandy grinned. "Everything always works right for engineers. It's a conspiracy."

"Sure," Cliff said vaguely, consulting his chrono. "Say, what's the matter with your voice?"

The reaction to that simple question was shocking; Dr. Brandias turned white. Brandy, who had taught Cliff to control his adrenals and pulse against shock reaction, was showing one himself, an uncontrolled shock reaction triggered to a random word. Brandy had taught that this was a good sign of an urgent problem suppressed from rational calculation, hidden, and so only able to react childishly in irrational identifications, fear sets triggered to symbols.

The square practical looking doctor was stammering, looking strangely helpless. "Why . . . uh . . . uh . . . nothing." He turned hastily back to his desk.

The news service clicked into life. "The concert is over," it announced.

Cliff hesitated for a second, considering Brandias' broad stooped back, and remembering what he had learned from the doctor's useful lessons on fear. What could be bad enough to frighten Brandy? Why was he hiding it from himself?

He didn't have time to figure it out, he had to get hold of Archy. "See you later." Poor Brandy. Physician, heal thyself.

People were streaming up from the concert.

He strode out into the corridor and headed for the elevator, answering the hails of friends with a muttered greeting. At the door of the elevator Mrs. Gibbs stepped out, trailing her husband. She passed him

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with a gracious: "Good evening, Cliff."

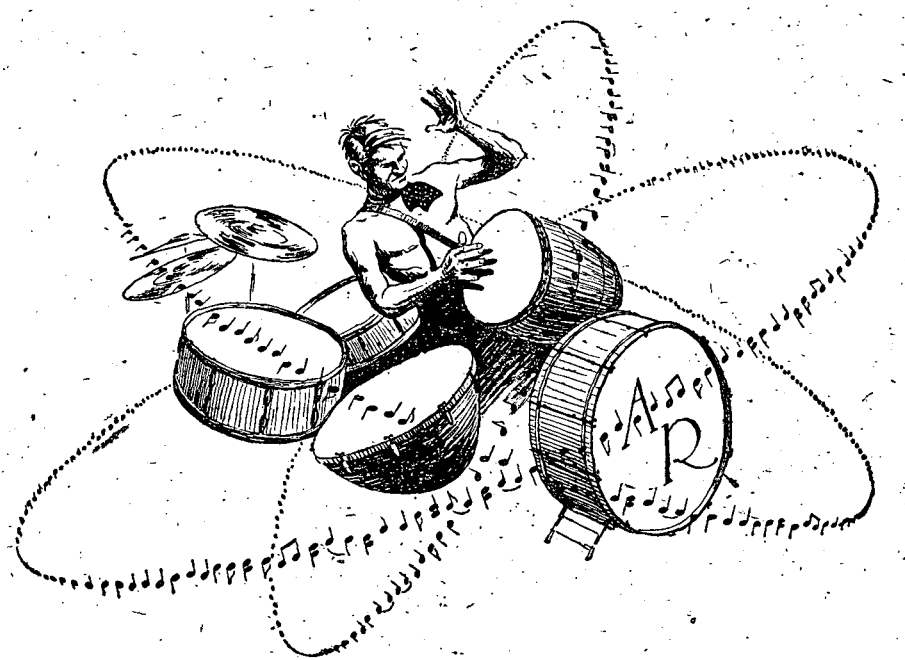
But Willy Gibbs stopped. "Hi, Cliff. Did you see the new movie? You fellows up around Pluto sure get the breaks." Oddly the words came out in a strange singsong that robbed them of meaning. As Cliff wondered vaguely what was wrong with the man, Mrs. Gibbs turned and tried to hurry her husband with a tug on his arm.

Willy Gibbs went on chanting. "There wasn't even an extra to play me in this one." The ecologist absently acknowledged his wife's repeated nudge with an impatient twitch of his shoulder. The shoulder twitched again, reasonlessly, and kept on twitching as the ecologist's voice became jerky. "It's . . . risks . . . that . . . appeal to . . . them. Maybe I . . . should . . . write . . . an article . . . about . . . my . . . man . . . eating . . . molds . . . or *reep beep tatatum la* kiki*ki*noo *stup.*"

Mrs. Gibbs glared icily at her husband, and Willy Gibbs suddeny went deep red. "Be seeing you," he muttered and hurried on. As the elevator door slid closed Cliff thought he heard a burst of whistling, but the door shut off his view and the elevator started softly downward.

He found Archy in the stage rehearsal room at 1.6 G. As he opened the door a deep wave of sound met him.

Eight teen-age members of the



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orchestra sat around the room, their eyes fixed glassily on the drummer. Archy Reynolds sat surrounded by drums, using his fingertips with an easy precision, filling the room with a vibrating thunder that modulated through octaves like an impossibly deep passionate voice.

The sound held him at the door like a thick soft wall.

"Archy," he said, pitching his voice to carry over the drums. The cold eyes in the bony face flickered up at him. Archy nodded, flipped the score over two pages, and the drumbeat changed subtly. A girl in the orchestra lifted her instrument and a horn picked up the theme in a sad intermittent note, as the drumbeat stopped. Archy unfolded from his chair and came over with the smallest drum still dangling from one bony hand. Behind him the horn note rose up instantly and a cello began to whisper.

He had grown tall enough to talk to Cliff face to face, but he read Cliff's expression with a curiosity that was preoccupied, and as remote as a telescope.

"What is it, Mr. Baker?"

"Brace yourself Jughead." Cliff said kindly, wondering how Archy would take the shock. The kid had always wanted to go along on a project. It was funny that now he would go to help instead of watch. He paused, collecting words. "How would you like to go up to Pluto Station and be my partner for a while?"

Archy looked past him without blinking, his bony face so preoccupied that Cliff thought he had not heard. He began again. "I said, how would you like—"

The horn began to whimper down to a silence, and the orchestra stirred restlessly. Archy shifted the small drum under his arm and laid his fingertips against it.

"No," he said, and walked back to his place, his fingers making a shuffling noise on the drum that reminded Cliff of a heart beating. The music swelled up again, but it was strange. Cliff could see someone striking chords at the piano, a boy with a flute—all the instruments of an orchestra sounding intermittently, but they were unreal. The sound was not music, it was the jumbled voices of a dream, laughing and muttering with a meaning beyond the mind's grasp.

A dull hunger to understand began to ache in his throat, and he let his eyes half close, rocking on his feet as the dreamlike clamor of voices surged up in his mind.

Instinct saved him. Without remembering having moved he was out in the hall, and the clean slam of the soundproofed door cut off the music and left a ringing silence.

At Pluto Station a field interacted subtly with fields out of its calculated range, minor disturbances resonated and built, and suddenly the field moved. Ten feet to one side, ten feet back.

"Medico here," said Smitty on a directed beam, tightening the left

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elbow joint of his spacesuit with his right hand. He was using all the strength he had, trying to stop the jet of blood from where his left hand had been. Numbly he moved back as the field began to swing towards him again. He hummed two code notes that switched his call into general beam, and said loudly and not quite coherently: "Oscillation build up, I think. Something wrong over here. I don't get it."

The hall was painted soberly in two shades of brown, with a faint streak of handprints running along the wall and darkening the doorknobs. It looked completely normal. Cliff shook his head to shake the ringing out of his ears, and snorted, *"What the sam hill!" His voice* was reassuringly sane, loud and indignant. Memory came back to him. *He said no. He said* no!

What now? He strode furiously toward the public elevator. *Watch your temper,* he cautioned himself. *For Pete's sake! Stop talking to yourself. Archy will listen when it's explained to him. Wait till he's through.* Eight more minutes. They were only going over a flubbed phrase from the concert.

A snatch of the tune played by the flute came back to him, with a familiar ring. He whistled it tentatively, then with more confidence. It sounded like the Reynolds automatics running through its frequency selection before giving service. The elevator stopped at the gym level and loaded on some people. They crowded into the elevator, greeted Cliff jerkily, and then stood humming and whistling and twitching with shame-faced grins, avoiding each other's eyes. They all sounded like the Reynolds automatics, and all together they sounded like the bird cage at the zoo.

"What the devil," muttered Cliff as the elevator loaded and unloaded another horde of grinning imbeciles at every level. "What's going on!" Cliff muttered, beginning to see the scene through a red haze of temper. "What's going on!"

At one G he got off and strode down the corridor, cooling himself off. By the time he reached the door marked *Baker* he had succeeded in putting it out of his mind. With a brief surge of happiness he came into the cool familiar rooms and called, "Mary."

Bill, his ten-year-old, charged out of the kitchen with a half-eaten sandwich in his hand, shouting.

"Pop! Hey, I didn't know you were coming!" He was grabbed by Cliff and swung laughing towards the ceiling. "Hey! Hey! Put me down. I'll drop my sandwich."

Laughing, Cliff threw him onto the sofa. "Go on, you always have a sandwich. It's part of your hand."

Bill got up and took a big bite of the sandwich, fumbling in his pocket with the other hand. "Hm-m-m," he said unintelligibly, and pulled out a child's clicker toy, and began clicking it. He gulped, and said, in a muffled voice. "I've got to go back to class. Come watch me, Pop. You can

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give that old teacher a couple of tips, I bet."

There was something odd about the tones of his voice even through the sandwich, and the clicker clicked in obscure relation to the rhythm of his words.

Cliff tried not to notice. "Where's your mom?"

Bill swayed up and down gently on his toes, clicking rapidly, and singing, "*Reeb* beeb. At work, Pop. The lab head has a new lead on something, and she works a lot. Foo *doo*."

Cliff exploded.

"Don't you click at me! Stand still and talk like a human being!"

Bill went white and stood still.

"Now explain!"

Bill swallowed. "I was just singing," he said, almost inaudibly. "Just singing."

"It didn't sound like singing!"

Bill swallowed again. "It's Archy's tunes. Tunes from his concerts. Good stuff. I . . . we sing them all the time. Like opera, sort of."

"Why?"

"I dunno, Pop. It's fun, I guess. Everybody does it."

Cliff could hear a faint singsong note in the faltering voice. "Can you stop? Can *anyone* stop?"

"I dunno," Bill mumbled. "For Pete's sake, Pop, stop shouting. When you hear tunes in your head it doesn't seem right not to sing them."

Cliff opened the door and then paused, hanging on to the knob.

"Bill, has Archy Reynolds done anything to the library system?"

"No." Bill looked up with a wan smile. "He's going to be a great composer instead. His pop's tapes are all right. You know, Pop, I just noticed, I *like* the sound of the automatics. They sound hep."

"Hep," said Cliff, closing the door behind him, moving away fast! He had to get out of there. He couldn't afford to think about mass insanity, or about Bill, or Mary, or the Reynolds' automatics. His problem was to get Archy up to Pluto Station. He had to stick to it, and keep from thinking questions. He looked at his chrono. The first deadline for leaving was coming too close. No use mincing words with Archy. He'd let him know that he was needed.

Archy was not at the rehearsal room. He was not at the library. Cliff dialed the Reynolds' place, and after a time grew tired of listening to the ringing and hung up. The time was growing shorter. He picked up the phone again and looked at it. It buzzed inquiringly in his hand, an innocent looking black object with an earphone and mouthpiece, which was part of the strange organization of computer, automatic services, and library files which Doc Reynolds had left when he died. Cliff abandoned questions. He did not bother to dial.

"Ring Archy Reynolds, wherever he is," he demanded harshly. "Get me Archy Reynolds. Understand? Archy Reynolds." It might work.

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The buzz stopped. The telephone receiver trilled and clicked for a moment in a whisper, playing through a scale, then it started ringing somewhere in Station A. Waiting, Cliff tried to picture Archy, but could bring back only an image of a thin twelve-year-old kid who tagged after Mike and him, asking questions, always the right questions, begging to be taken for space rides, looking up at him worshipfully.

The sound of Archy's voice dispelled the images and brought a clear vision of a preoccupied adult face. "Yes?"

"Archy," Cliff said, "you're *needed* up at Pluto Project. It's urgent. I haven't time to explain. We have ten minutes to get going. I'll meet you at the spacelock."

He didn't call Cliff "Chief" any more.

"I'm busy, Mr. Baker," said the impersonal voice. "My time is taken up with composing, conducting and recording."

"It's a matter of life and death. I couldn't get anyone else in time. You can't refuse, Jughead."

"I can."

Cliff thought of kidnaping. "Where are you?"

The click of the phone was final. Cliff looked at the receiver in his hand, not hanging up. It was buzzing innocently. The intonations of Archy's voice had been an alien singsong. "Where is Archy Reynolds?" Cliff said suddenly. He gave the receiver a shake. It buzzed without answering. Cliff hung up jerkliy. "How did you know?" he asked the inanimate phone.

Abruptly Cliff's chrono went off, loudly ringing out the deadline. A little later, eighteen miles away in space his ship would automatically begin to apply jet brakes. After that moment there would not be another chance to take off for Pluto Station for seven hours. It was too late to do anything. There was no need to hurry now, no need to restrain questions and theories; he could do what he liked.

The Reynolds' tapes. He was moving, striding down the hall, knowing he had himself under control, and his expression looked normal.

Someone caught hold of his sleeve. It was a stranger, meticulously dressed, looking odd in a place where no one wore much more than shorts.

"What?" Cliff asked abruptly, his voice strained.

The stranger raised his eyebrows. "I am from the International Business Machine Corporation," he stated, being politely reproving. He stroked his brief case absently. "We have heard that a Martin Reynolds, late deceased, had developed a novel subject-indexing system—"

Cliff muttered impatiently, trying to move on, but the business agent was persistent. Presumably he was tired of being put off with jibbering. He gripped Cliff's arm doggedly, talking faster.

"We would like to inquire about the patent rights—" The agent was brought to a halt by a sudden recog-

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nition of the expression on Cliff's face.

"Take your hand off my arm," Cliff requested with utmost gentleness, "I am busy." The I.B.M. man dropped his hand hurriedly and stepped back.

Ten minutes later, McCrea, the South American, stuck his head into the reading room and saw Cliff sitting at a reference desk.

"Hi," Cliff called tonelessly, without altering the icy speed with which he was taking numbers from a Reynolds decimal index chart and punching them into the selection panel. The speaker on the wall twittered unceasingly, like a quartet of canaries.

"Que pasa? What happens I mean," asked the librarian, smiling ingratiatingly.

Cliff hit the right setting. Abruptly all twittering stopped. Smiling tightly, Cliff reached for the standard Dewey-Whitehead index to the old library tapes. They were probably still latent in the machine somewhere. It wouldn't take much to resurrect them and restore the station to something resembling a normal inanimate machine with a normal library, computer, and servomech system. Whatever was happening, it would be stopped.

The wall speaker clicked twice and then spoke loudly in Doc Reynolds' voice.

"Sorry. You have made a mistake," he said. But Doc Reynolds was dead.

In the next fraction of a second Cliff began and halted three wild incomplete motions, and then gripped the edge of the desk with both hands and made himself listen. It was only a record. Doc Reynolds must have set it in years before as a safeguard.

"This setting is dangerous to the control tapes," said the recorded voice kindly. "If you actually need data on Motive-320 cross symbols 510.2, you had better consult me for a safe setting. If I'm not around you can get some help from either Mike Cohen or the kid. If you need Archy you'll find him back in the tube banks, or in the playground at .5 G or—"

With a violent sweep of his arm, Cliff wiped the panel clean of all setting, and stood up.

"Thanks," said the automatics mechanically. There was no meaning in the vodar voice. It always switched off with that word.

The little American touched his arm, asking anxiously, *"Que pasa? Que tiene usted?"*

Cliff looked down at his hands and found them shaking. He had almost wiped off the Reynolds tapes with them. He had almost destroyed the old librarian's life work, and crippled the automatic controls of Station A, merely from a rage and a wild unverified suspicion. The problem of the madness of Station A was a problem for a psychologist, not for a blundering engineer.

He used will in the right direction as Brandy had shown all the

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technicians of the station how to use it, and watched the trembling pass. "Nada," he said slowly. "Absolutamente nada. Go take in a movie or something while I straighten this mess out." He fixed a natural smile on his face and headed for the control room.

Pierce was due to be passing the station in beam range.

Cliff had preferred taking the psychologist at face value, but now he remembered Pierce's idle talk, his casual departure, apparently leaving nothing done and nothing changed, and added to that Spaceway's known and immutable policy of hiring only the top men in any profession, and using them to their limit.

The duty of a company psychologist is a simple thing, to keep men happy on the job, to oil the wheels of efficiency and co-operation, to make men want to do what they had to do. If there were no visible signs of Pierce having done anything, it was only because Pierce was too good a craftsman to leave traces—probably good enough to solve the problem of Station A and straighten Archy out.

In the control room Cliff took a reading on Pierce's ship from blinker buoy reports. In four minutes the station automatics had a fix on the ship and were trailing it with a tight light beam. "Station A calling flitter AK 48 M. Hi Pierce."

"Awk!" said a startled tenor voice from the wall speaker. "Is that Cliff Baker? I thought I left you back at Pluto. Can you hear me?" Behind Pierce's voice Cliff could hear a murmur of other voices.

"I hear too many."

"I'm just watching some stories. I've been bringing my empathy up with mirror training. I needed it. Association with you people practically ruined me as a psychologist. I can't afford to be healthy and calm; a psychologist isn't supposed to be sympathetic to square-headed engineers, he's supposed to be sympathetic to unhealthy excitable people."

"How's your empathy rating now?" Cliff asked, very casually.

"Over a hundred percent, I think," Pierce laughed. "I know that's an idiotic sensitivity, but it will tone down later. Meanwhile I'm watching these sterios of case histories, and living their lives so as to resensitize myself to other people's troubles." His voice sharpened slightly. "What did you call for?"

Cliff dragged the words out with an effort, "Something strange is happening to everybody. The way they talk is . . . I think it is in your line."

"Send for a psychiatrist," Pierce said briskly. "I'm on my vacation now. Anna and I are going to spend it at Manhattan Beach with the baby."

"But the delay—"

"Are they in danger?" Pierce asked crisply.

"I don't know," Cliff admitted, "but they all—"

"Are they physically sick? Are they even unhappy?"

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"Not exactly," Cliff said unwillingly. "But it's . . . in a way it's holding up Pluto Project."

"If I went over now, I couldn't reach Earth in time."

"I suppose so," Cliff said slowly, beginning to be angry, "but the importance of Station A and Pluto Station against one squalling baby—"

"Don't get mad," said Pierce with unexpected warmth and humor. "Ann and I think this is a special baby, it's important too. Say that every man's judgment is warped to his profession, and my warp is psychology. My family tree runs to psychology, and we are working out ways of raising kids to the talent. Anna is a first cousin; we're inbreeding, and we might have something special in this kid, but he needs my attention. Can you see it my way, Cliff?" His voice was pleading and persuasive. "Communication research is what my family runs to, and communication research is what the world needs now. I'd blow up Pluto Station piece by piece for an advance in semantics! Cultural lag is reaching the breaking point, and your blasted space expansion and research are just adding more rings to the twenty-ring circus. It is more than people can grasp. They can't learn fast enough to understand, and they are giving up thinking. We've got to find better ways of communicating knowledge in this generation, before it gets out of hand." Pierce sounded very much in earnest, almost frightened. "You should see the trend curves on general interest and curiosity. They're curving *down*, Cliff, all down."

"Let's get back to the subject," Cliff said grimly. "What about your duty to Pluto Station?"

"I'm on my vacation," said Pierce. "Send to Earth for a psychiatrist."

"I thought you were supposed to be sympathetic! Over a hundred percent you said."

"Eye empathy only," Pierce replied, a grin in his voice. "Besides, I'm still identified with the case in the sterio I'm watching, a very hard efficient character, not sympathetic at all."

Cliff was silent a moment, then he said, "Your voice is coming through scrambled. Your beam must be out of alignment. Set the signal beam dial for control by the computer panel, and I'll direct you." Enigmatic scrapings and whirrings came over the thousands of mile beam to Pierce.

With a sigh he switched off the movie projector and moved to the control panel, where Cliff's voice directed him to manipulate various dials.

"O.K. You're all set now," Cliff said. "Let's check. You have the dome at translucent. Switch it to complete reflection on the sun side and transparency on the shadow side, turn on your overhead light and stand against the dark side."

"What's all this rigmarole?" Pierce grumbled. With the blind faith of a layman before the mysteries of machinery, he cut off the

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steady diffused glow of sunlight, and stood back against the dark side, watching the opposite wall. The last shreds of opacity faded and vanished like fog, and there was only black space flecked with the steady hot brightness of the distant stars. The bright shimmer of the parabolic signal-beam mirror took up most of the view. It was held out and up to the fullest extension of its metallic arm, so that it blocked out a six-foot circle of sky. Pierce looked at it with interest, wondering if he had adjusted it correctly. Its angle certainly looked peculiar.

As he looked, the irregular shimmering light began to confuse his eyes. He suddenly felt that there were cobwebs forming between himself and the reflector. Instinctively Pierce reached out a groping hand, squinting with the effort to see.

His eyes found the focus, and he saw his hand almost touching a human being!

The violence with which he yanked his hand back threw him momentarily off balance. He fought for equilibrium while his eyes and mind went through a wrenching series of adjustments to the sight of Cliff Baker, only three feet high, floating in the air within reach of his hand. The effort was too great. At the last split second he saved himself from an emotional shock wave by switching everything off. A blank unnatural calm descended, and he said:

"Hi, Cliff."

The figure moved, extending a hand in a reluctant pleading gesture. Under the brilliant overhead light its expression looked strained and grim. "Pierce, Pierce, listen. This is trouble. You have to help." There was no mistaking the sincerity of the appeal. To the trained perception of the psychologist the relative tension of every visible muscle was characteristic of tightly controlled desperation, but to the intensified responsiveness of his feelings the personality and attitude of Cliff Baker burned in like hot iron, shaping Pierce's personality to its own image. Instinctively Pierce tried to escape the intolerable inpour of tension by crowding back against the wall, but the figure followed, expanding nightmarishly.

Then abruptly it vanished. It had been some sort of a sterio, of course. For a long moment the psychologist leaned against the curved wall with one hand guarding his face, waiting for his heart to find a steady beat again, and his thoughts to untangle.

"Over a hundred . . . a hundred percent. Cliff, you don't— What kind of a—"

"The projection?" The engineer's voice spoke cheerfully from the radio. "Just one of the things you can do with a tight-beam parabolic reflector. Some of the boys thought it up to scare novices with, but I never thought it would be useful for anything."

"Useful! Cliff!" Pierce protested. "You don't know what you did!"

The engineer chuckled again. "I didn't mean to scare you," he said kindly. "I was trying something else.

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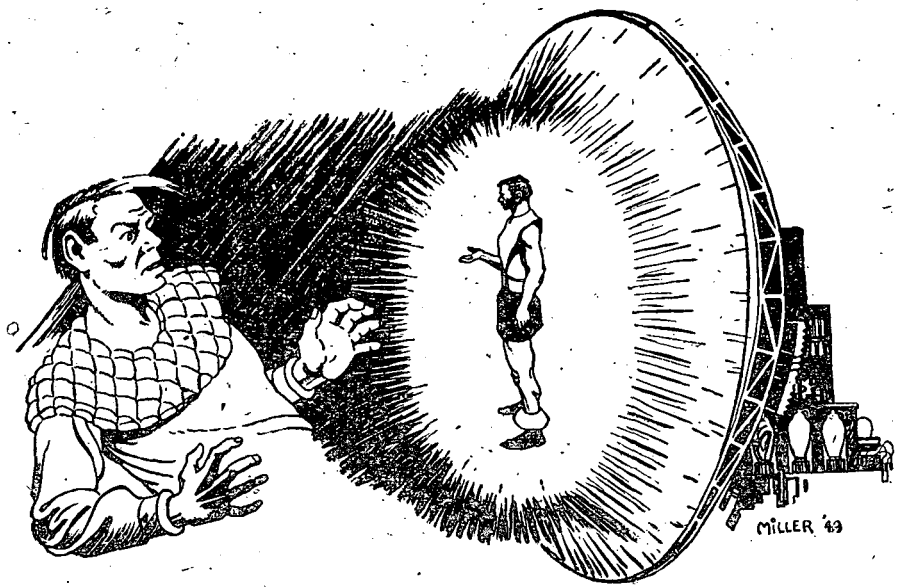

Eye empathy you said— How do you feel about finding out what's wrong at Station A?"

"How do you expect me to feel?" Pierce groaned. "Go on, tell me what to do!"

"Come find out what it is; and cure them. And work on Archy Reynolds first."

There was a long pause, and when Pierce spoke, his voice had changed again. "No, blast it! You can't have me like that. I can't just do what you want without thinking! It's phony. No station full of people goes crazy together. I don't believe it."

"I saw it," Cliff answered grimly.

"You *say* you saw it. And you force me to go to cure them—without explanation, without saying why it is important. What has it to do with Pluto Station? It isn't like you to force anybody to do anything, Cliff. It's not in your normal pattern! It isn't like you to cover and avoid explanations."

"What are you driving at?" Cliff said uneasily. "Let me tell you how to set the controls to head for Station A. You have to get here fast!"

"Covering up something. There's only one situation I know of that would make you try to cover." Pierce's voice sharpened with determination. "It must have happened. Listen, Cliff, I'm going to give this to you straight. I know the inside of your head better than you do. I know how you feel about those fluent fast-talking friends of yours at the station and on the job. You're afraid of them—afraid they'll find out you're just a dope. Something

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has happened at Pluto Station project, and it is still happening—something *bad,* and you think it is *your* fault, you don't know it, but you feel guilty. You're trying to cover up. Don't do it. Don't cover up!"

"Listen," Cliff stammered, "I—"

"Shut up," Pierce said briskly. "This is shock treatment. One level of your personality must have cracked. It would under that special stress. You had an inferiority complex a yard wide. You're going to reintegrate fast on another level right now. File away what I said and listen for the next shock. *You aren't a dope. You're an adjustable analogue.*"

"A what?"

"An adjustable analogue. You think with kinesthetic abstractions. Other people are arithmetic computers. They think with arbitrarily related blocks of memorized audio-visual symbols. That's why you can't talk with them. Different systems."

"What the devil—"

"Shut up. You'll get it in a minute. I ought to know this. I was matched into your feelings for half an hour at a time at Pluto Station. It took me four days to figure out what happened. Your concepts aren't visual, they are kinesthetic. You don't handle the problems of dynamics and kinetics with arbitrary words and numbers related by some dead thinker, you use the raw direct experience that your muscles know. You *think* with muscle tension data. I didn't dare follow you that far. Who knows what primitive integration center you have reactivated for it. I can't go down there. My muscle tension data abstracts in the forebrain. That's where I keep my motives and my ability to identify with other people's motives. If I borrowed your ability, I might start identifying with can openers."

"What the—"

"Pipe down," said Pierce, still talking rapidly. "You're following me and you know it. You aren't stupid but you're conditioned against thinking. You don't admit half you know. You'd rather kid yourself. You'd rather be a humble dope and have friends, than open your eyes and be an alien and a stranger. You'd rather sit silent at a station bull session and kick yourself for being a dope, than admit that they are word-juggling, talking nonsense. Listen, Cliff—you are not a dope. You may not be able to handle the normal symbol patterns of this culture, but you have a structured mind that's integrated right down to your boots! You can solve this emergency yourself. So what if your personality has been conditioned against thinking? Everybody knows the standard tricks for suspending conditioning. Put in cortical control, solve the problem first, whatever it is, and then be dumb afterwards if that's what you want!"

After a moment Cliff laughed shakily. "Shock treatment, you call it. Like being whacked over the head with a sledge hammer."

"I think I owed you a slight

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shock," Pierce said grimly. "May I go?"

"Wait a sec, aren't you going to help?"

Pierce sounded irritable. "Help? Help what? You have more brains than I have, solve your own problems: Pull yourself together, Cliff, and don't give me any more of this raving about a whole station full of people going bats! It's not true!" He switched off.

Cliff sat down on the nearest thing resembling a chair, and made a mental note never to antagonize psychologists. Then he began to *think*.

Once upon a time the New York Public Library shipped a crate of microfilm to Station A. The crate was twenty by twenty and contained the incredible sum of the world's libraries. With the crate they shipped a librarian, one M. Reynolds to fit the films into an automatic filing system so that a reader could find any book he sought among the uncounted other books. He spent the rest of his life trying to achieve the unachievable, reduce the system of filing books to a matter of perfect logic. In darker ages he would have spent his life happily arguing the number of bodiless angels that could dance on the point of a pin.

They became used to seeing him puttering around, assisted by his little boy, or reading the journal of symbolic logic, or, temporarily baffled, trying to clear his mind by playing games of chess, and cards, in which he beat all comers.

Once he grew excited by the fact that computers worked on a numerical base of two, and sound on the log of two. Once he grew interested in the station's delicate system of automatic controls and began to dismantle it and change the leads. If he had made a wrong move, the station would have returned to its component elements, but no one bothered him. They remembered the chess games, and left the automatics to him. They were satisfied with the new reading desks, and after a while there was a joke that if you made a mistake they would give you a ham sandwich, and a joke that the automatics would deliver pretty girls and blow up if you asked for a Roc's egg, but still no one realized the meaning of Doc Reynolds' research.

After all, it was simply the proper classification of subjects, and a symbology for the library keyboard that would duplicate the logical relations of the subjects themselves. No harm in that. It would just make it easier for the reader to find books.

Once again Cliff stood under the deep assault of sound. This time it was tapes of two of Archy's best jazz concerts, strong and wild. Once again the rhythms fitted themselves into the padded beat of his heart, the surge of blood in his ears, and other, more complex rhythms of the nerves, subtly altering and speeding them in mimicry of the pulse of emotions, while flute notes played with the sound of Reynolds' automatics, automatics impassioned, oddly fitting

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and completing the deeper surges of normal music.

Cliff stood, letting the music flow through him, subtly working on the pattern of his thought. Suddenly it was voices, a dreamlike clamor of voices surging up in his mind and closing over him in a great shout, and then passing, and then the music was just music, very good music with words. He listened calmly, with enjoyment.

It ended, and he left the room and went whistling down the corridor walking briskly, working off some energy. It was the familiar half ecstatic energy of learning, as if he had met a new clarifying generalization that made all thought much simpler. It kept hitting him with little sparks of laughter as if the full implication of the idea still automatically carried their chain reaction of integration into dim cluttered corners of his mind releasing them from redundancy and the weariness of facts.

He passed someone he knew vaguely, and lifted a hand in casual greeting.

"Reep beeb," he said.

It was a language.

The people of Station A did not know that it was a language, they thought they were going pleasantly cuckoo, but he knew. They had been exposed a long time to the sound of Reynolds' machines. Reynolds had put in the sound system and brought it down to audible range to help himself keep track of the workings of it, and the people of Station A for five years had been exposed to the sounds of the machine translating all their requests into its own symbolic perfect language, reasoning aloud with it, and then stating the answer in its own language before translating it back into action, or service, or English or mathematics.

It had been an association in their minds, and latent, but when Archy included frequency symbol themes in his jazz, they had come away humming the themes; and it had precipitated the association. Suddenly they could not stop humming and whistling and clicking, it seemed part of their thought, and it clarified thinking. They thought of it as a drug, a disease, but they knew they liked it. It was seductive, irresistible, and frightening.

But to Cliff it was a language, emotional, subtle and precise, with its own intricate number system. He could talk to the computers with it.

Cliff sat before the computer panel of his working desk. He did not touch it. He sat and hummed to himself thoughtfully, and sometimes whistled an arpeggio like a Reynolds' automatic making a choice.

A red light lit on the panel. Pluto had been contacted and had reported. Cliff listened to the speel of the verbal report first as it was slowed down to normal speed. "I didn't know you could reach us," said the medico. "Ole is dead. Smitty has one hand, but he can still work. Danny Orlando—Jacabson—" rapidly the doctor's weary voice

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went through the list, reporting on the men and the hours of work they would be capable of. Then it was the turn of the machinery and orbit report. The station computer translated the data to clicks and scales and twitters, and slowly the picture of the condition of Pluto Station project built up in Cliff's mind.

When it was complete, he leaned back and whistled for twenty minutes, clicking with a clicker toy and occasionally blowing a chord on a cheap harmonica he had brought for the use, while the calculator took the raw formulas and extrapolated direction tapes for all of Pluto Station's workers and equipment.

And then it was done. Cliff put away the harmonica, grinning. The men would be surprised to have to read their instructions from direction tapes, like mechanicals, but they could do it.

Pluto Station Project was back under control.

Cliff leaned back, humming, considering what had been done, and while he hummed the essentially musical symbology of the Reynolds index sank deeper and deeper into his thoughts, translating their natural precision into the precision of pitch, edging all his thinking with music.

On Earth teemed the backward human race, surrounded by a baffling civilization, understanding nothing of it, neither economics nor medicine or psychology, most of them baffled even by the simplicity of algebra, and increasingly hostile to all thought. Yet through their days as they worked or relaxed, the hours were made pleasant to them by music.

Symphony fans listened without strain while two hundred instruments played, and would have winced if a single violin struck four hundred forty vibrations per second where it should have reached four hundred forty-five. Jazz fans listened critically to a trumpeter playing around with a tune in a framework of six incommensurable basic rhythms whose relative position shifted mathematically with every note. Jazz, symphony or both, they were all fans and steeped in it. Even on the sidewalks people walked with their expressions and stride responding to the unheard music of the omnipresent earphones.

The whole world was steeped in music. Saturated in music of a growingly incredible eloquence and complexity, of a precision and subtlety that was inexpressible in any other language or art, a complexity whose mathematics would baffle Einstein, and yet it was easily understandable to the ear, and to the trained sensuous mind area associated with it.

What if that part of the human mind were brought to bear on the simple problems of politics, psychology and science?

Cliff whistled slowly in an ordinary non-index whistle of wonderment. No wonder the people of Station A had been unable to stop.

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They hummed solving problems, they whistled when trying to concentrate, not knowing why. They thought it was madness, but they felt stupid and thick headed when they stopped, and to a city full of technicians to whom problem-solving was the breath of life, the sensation of relative stupidity was terrifying.

The language was still in the simple association baby-babbling stage, not yet brought to consciousness as a language, not yet touching them with a fraction of its clarifying power—but it was raising their intelligence level.

Cliff had been whistling his thoughts in index, amused by the library machine's reflex bookish elaboration of them, for its association preferences had been set up by human beings, and they held a distinct flavor of the personalities of Doc Reynolds and Archy. But now, abruptly the wall speaker said something absolutely original, phrased with brilliance and dogmaticism. "Why be intelligent? Why communicate when you are surrounded by cows? It would drive you even more bats to know what they think." The remark trailed off and scattered in abstract references to nihilism, consensus, eternity and Darwin, which were obviously association trails added by the machine, but the central remark had been Archy himself. Somewhere in the station Archy was tinkering idly and unhappily with the innards of his father's machine, whistling an unconsciously logical jazz counterpoint to one of the strands of twittering that bombarded his ears.

It was something like being linked into Archy's mind without Archy being aware of it. Cliff questioned, and suggested topics. The flavor of the counterpoint was loneliness and anger. The kid felt that Cliff and Mike had deserted him in some way, for his father had died when he was in high school, and Cliff and Mike had long given up tutoring him and turned him over to his teachers. His father had died, and Cliff and Mike were not around to talk with or ask advice, so leaving Archy to discover in one blow of undiluted loneliness that his mental immersion in science and logic was a wall standing between him and his classmates, making it impossible to talk with them or enjoy their talk, making it impossible for his teachers to understand the meaning of his questions. Archy had reacted typically in three years of tantrum, in which he despairingly hated the world, hated theory and thinking, and sought opiate in girls, dancing, and a frenzied immersion in jazz.

He had not even noticed what his jazz had done to the people who listened.

Cliff smiled, remembering the abysmal miseries of adolescence, and smiled again. Everyone else in the station was miserable, too. There was Dr. Brandias, who should have been trying to solve the problem of the jazz madness, miserably turning over the pages of a light magazine

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in the next cubical, pretending not to notice Cliff's strange whistling and harmonica blowing.

"Brandy."

The medico looked up and flushed guiltily. "How are you doing, Cliff?"

"Come here. I've something to tell you."

It began with a lesson tour, pointing and describing in index. It became a follow-the-leader with each action in turn described in index—and progressed.

The I.B.M. man doggedly looking for Archy Reynolds through the suddenly deserted station at last wandered in to the huge gym at 1.3G and was horrified to see Archy Reynolds and Cliff Baker leading the entire staff of Station A in a monstrous conga line. Archy Reynolds was beating a drum under one arm and clicking castanets with the other, while the big sober engineer blew weird disjointed tunes on a toy harmonica and the line danced wildly. The I.B.M. man shut his eyes, then opened them grimly.

"Mr. Reynolds," he called. He was a brave man, and tenacious. "Mr. Reynolds."

Archy stopped and the whole dance stopped with him in deadly silence, frozen in mid step.

"What can I do for you?"

The I.B.M. man pulled three reels of tape from his brief case. "Senor McCrea showed me Dr. Reynolds' basic tapes, and I took a transcription. Now about the patent rights—" He took a deep breath and swung his glance doggedly across the host of watching faces back to the lean impassive face of the young man who held the rights to the Reynolds tapes. "Could we discuss this in private?"

Instead of replying, the young man exchanged a glance with Cliff Baker, and they both began whistling rapidly, then Archy Reynolds stepped back with a gesture of dismissal and Cliff Baker turned, smiling.

"One condition," he said, the intonations of his deep, hesitant voice as alien as the voices of all others of the station, although earlier in the hall he had sounded comparatively sane to the I.B.M. man. "Only one condition, that I.B.M. leave the sound-frequency setup Reynolds has in his plans at audible volume, no matter how useless the yeeps seem to an engineer. Except for that, it's all yours." He smiled oddly and began whistling again, and the people in the lines behind him began restlessly swaying from one foot to another. Archy Reynolds began to pound on his drum.

"What?" gasped the I.B.M. man.

"You can have the patent rights," Cliff replied over the din. "It's all yours!"

The dance was beginning again, the huge line slowly mimicking the actions of the leaders. As the I.B.M. man hesitated at the door, staring back at the strange sight, Cliff Baker was showing his wife some intricate step, and the others mimicked in pairs.

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The big engineer glanced towards the door, hesitated and hummed; clicked and whistled weirdly in a moment of complete stillness, then threw back his head and laughed. All eyes in the assemblage swiveled and came to rest on the I.B.M. man, and all through the hall there was a slow chuckle of laughter growing towards a howl.

Madness!

He stumbled through the door and fled, carrying in his brief case a new human race.

THE END

IN TIMES TO COME

For a somewhat longer-range prediction, we can say with some assurance that there will be articles, in the near future, replying to Hubbard's article on dianetics. But I want to point out that inasmuch as Astounding SCIENCE FICTION is not a news magazine, we do not run a tight publication schedule. This, as a matter of fact, is being written in the first week of March; it will be nearly a month before Hubbard's article appears. It will be a couple of months, minimum, before the first articles in reply could possibly appear in the magazine. I assure you such articles will be printed, however. Also, there will be further articles on the sidelights of dianetics and dianetic therapy.

The article in July, incidentally, will be "This Is Hot!" by Arthur Parlett. "Hot" in this case means radioactive—and the corpse of a broken uranium atom is almost as difficult to dispose of, almost as embarrassing to its possessor, as the corpse of a freshly murdered victim. Some rather extreme measures are, at times, required to get rid of radioactives where they won't bother anyone!

In the story department, Lawrence O'Donnell is back with "Heir Apparent". The setting's a peaceful tropical island—but the tensions generated there penetrate the whole Solar System. And most of our readers are familiar with the sort of tensions Lawrence O'Donnell can build in a long novelette.

Also scheduled for July—or August if the issue gets overcrowded!—are stories by L. Sprague de Camp, Eric Frank Russell, and three brand-new authors, each with something worthwhile to add to science-fiction.

THE EDITOR.

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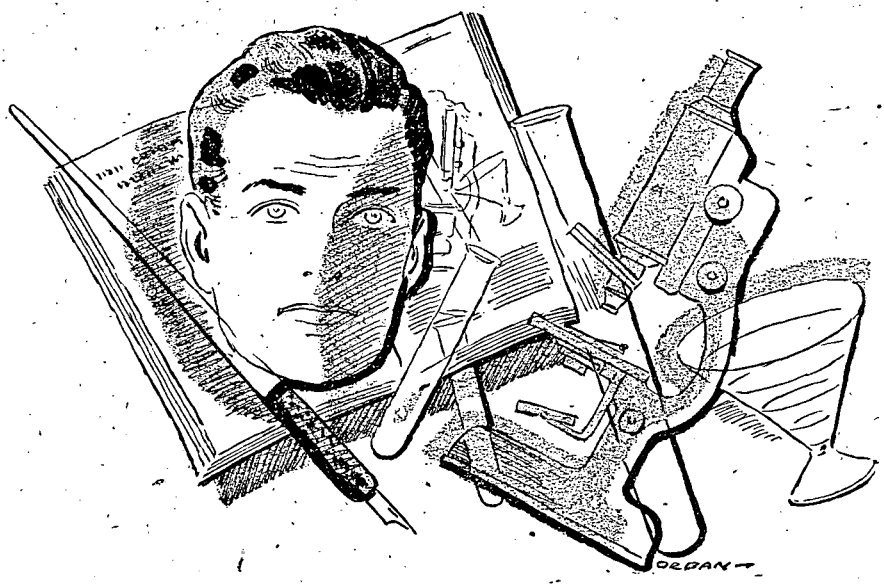

PUNCHING PILLOWS

BY CLEVE CARTMILL

The yarn's an interesting one. But there's a basic idea here that's still more interesting . . .

Illustrated by Orban

The waitress came over to the booth. "Jack Bland," she said, "wanted on the visor."

Jack looked at Gilda. "This is probably the minister. I left this number. He was worried about marrying us tomorrow, on a holiday." To the other couple, he said: "Excuse. Big business."

The face that filled the screen was not the minister's, but Pete's, the copy boy.

"Jack, listen," he said. "Lathrop's been trying to get you all day. I think you're in trouble. Wanta meet me outside?"

"Well, sure, Pete. What kind of trouble?"

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"The getting fired kind," Pete said, and blanked out.

Jack went back to the booth wearing a thoughtful frown. Gilda gave him a large, brown-eyed questioning stare.

"Trouble?"

Jack sat beside her, still frowning. "I. . . . don't know. That was Pete. He's all broken out in a rash of worry. Wants to see me outside."

"Why not here?"

Jack finished his drink. "He wants it private, for some reason. Wait for me. Order whatever you want on my tab."

He crossed the richly-carpeted floor of the Press Club, nodding to friends standing or sitting in small, quietly speaking groups, and went outside. Pete, his dark eyes more spaniellike than usual under an unruly shock of red hair, was waiting at the building entrance.

"Jack," he said in a low voice, "I wanted to break this to you on the quiet. Scuttlebutt has it that you're getting canned."

"But that's fantastic, Pete. Here I've just finished the biggest story of the century, and I think I did a good job on it."

"The story blew up. Lathrop killed it after it had been out about thirty minutes."

"Now that," Jack said firmly, "is impossible. That story *couldn't* blow up."

Pete shrugged. "All I know is what's on the grapevine. The office has been like a morgue all day. Lathrop went around muttering, and calling like a madman for you all over the country. I knew you had a date with your girl here, and thought I'd tip you off."

"I appreciate it, Pete. Lathrop still at the office?"

"Yeah. Said he'd wait all night if necessary, till you show up."

"O.K. Run up and tell Gilda I had to go to the office. Don't tell her why. And have a drink on me."

Jack got his monocar and took the underground freeway to the *Evening Telenews* building. He went into the orderly confusion of the city room, crossed to the city desk and waited quietly behind Lathrop while the city editor talked to one of the beat men on his small desk screen. The skeleton night staff went about its appointed tasks, running off color tapes on canned features, getting the latest dope on running stories, and so on.

But nobody gave him a glance. He felt they were avoiding his eye, and turned up a small, bitter smile. They were going to wait and see which way the cat jumped before making a move.

Lathrop blanked his screen, turned his round, red face to Jack with no expression.

"Heard you were looking for me," Jack said.

"Yeah. Let's go into Anderson's office. Private there."

They went into the managing editor's sanctum and Lathrop sat behind the streamlined desk. "You and your cure for cancer," he

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growled. "You got us into a mess. If I could have found you today, I'd have throttled you cheerfully."

"Maybe that would take some doing," Jack said coldly. "What's this all about?"

"We trusted you at least to verify your sources, Jack. You're an experienced newsman. So you give us this story about Wagner, a so-called cellular biologist, having developed a cure for all types of cancer."

"There's only one type," Jack interrupted. "And he didn't develop it. He just correlated material that's been in print for years."

"Never mind! Well, the guy isn't even a biologist. He's just a punk who hung around a laboratory and stole the dope that he published. And you based your article on a speech he was supposed to give in Chicago today. He didn't even show up."

"I don't believe you."

"Stop interrupting. I verified the facts right at the source. You worked on this story for two weeks. A couple of simple, basic calls would have blown it sky-high in fifteen minutes. You should have made those calls before anything else."

"My story is true," Jack said heatedly. "All the proof in the world exists—and checks."

"The story itself may be true, or it may not," Lathrop said. "What matters is, your sources were no good. And since you didn't verify them—" He let it hang.

"I'm not the first reporter with this outfit that ever made a mistake, Lathrop. There was that classic boner you yourself made when—"

"That's beside the point, Jack. The point is that so much pressure has been brought to bear from . . . oh, various sources . . . that you've got to be fired."

Jack frowned. "Advertisers, hm-m-m? Business office must."

Lathrop sighed. "You know I can't say. I'm sorry, Jack. I was sore because I couldn't find you anywhere today, and I've really caught it in the neck myself. I don't know whether I'll lose my job over it or not."

"All right," Jack said with sudden decision. "I think I'm being unjustly fired, but I can't defend myself right now. I went into this thing carefully on the main thesis. And it stacked up to one thing—there is a cure for cancer, and it's been known for a long time. Wagner simply correlated all the material, which is what I said in my story. And furthermore, there's something screwy behind this sudden storm. I'm going to find out what it is, and I'm going to get my job back."

"I wish you luck, Jack. I really do."

"As I get it," Jack went on, "the main reason I'm being fired is because somebody claims Wagner is not a cellular biologist. Right?"

"Right."

"Then my job is simple. All I have to do is prove that he is."

"I hope you can, Jack. But understand my position. I—"

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"I know," Jack broke in. "You're little better than an office boy. I was city editor myself, once. For a very short while. Well, I'm going back to the Press Club and break the sad news to Gilda. I was going to marry her tomorrow."

"Was?"

"Was. So long."

"But why?" Gilda wailed. "It's you I want to marry, not a job."

"Look, baby," Jack growled, "I've got to get on this thing. I can't take time off for marriage and a honeymoon. Plenty of funny stuff goes on under the surface, and I've got to find out what it is. I can get my job back in a hurry, simply by finding Wagner. But I've got to run down the facts on the opposition to make the story public. It won't hurt to wait a couple of weeks."

"But the arrangements—"

"They can be called off. I'll tell the minister you broke a leg. Listen, I'm just as disappointed as you are. But you should be able to understand my position. The humiliation of being fired on the charge of not verifying my sources, the loss of prestige among my friends, and all that stuff."

"Yes, I guess so," she muttered, "but I don't like it."

"Who does?"

He saw the waitress coming toward him along an aisle between tables, and felt a chill of premonition. His peculiar extra sensory perception was suddenly in high gear. Something had happened. He could feel it. He'd had this feeling before, when something big was in the air. He had always attributed to it his success in the business of disseminating news. His ex-success, that is.

"Again?" he asked the girl when she stopped at his booth. She nodded, and he went across the big room to the visor cubicles. "I've a feeling I won't like this," he told Gilda as he excused himself.

It was Lathrop's round face, no longer flushed with anger, but sad and sympathetic. "Afraid I've got bad news for you, Jack."

Jack snorted. "What could be worse than what you've already given me?"

"Wagner's body was found a few minutes ago, stuffed in a locker in the men's lounge at the airport."

"Oh, that's dandy," Jack said with furious despair. "That's just lovely. At least," he added wryly, "you got *one* story out of the deal. But thanks for letting me know."

As he hurried back to Gilda, various friends called to him.

"Hey, Jack, I'm sorry."

"Tough luck, kid."

"I hear you got a dirty deal."

Jack waved acknowledgments, but didn't stop. He reached the booth, remained standing. "I've got to scram. Will you get home under your own steam?"

"What happened?"

He told her. "I've got to get out there. I may not get a thing, but at least I can look around. My press

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pass is still good for tonight, I guess."

"What awful luck, darling."

"For me? For Wagner, too. I'll drop by after I'm finished. Wait up for me?"

"All night, if necessary. Good luck."

Jack hurried up to the roof and, disdainful of expense, took an air-cab. He was at the sprawling port in a matter of minutes and, seconds later, in the men's lounge.

Police, uniformed and plain-clothed, rival newsmen and Phil Carter from his own outfit, and photographers stood at strategic viewpoints, their attention fixed on an open door near the end of a long row of lockers.

The door guard let Jack through without comment, and he saw the body inside the locker, illumined by floodlights. Camera shutters snicked and, from a different angle, snicked again.

While the preliminaries proceeded, Jack surveyed those present. At one side from the official and semiofficial spectators stood a middle-aged, well-dressed man with a couple of traveling cases at his feet. He had opened the locker, Jack presumed.

Also at one side, with the traditional black bag and look of boredom on his thin, dark face, was the medical examiner, impatiently waiting the moment he could examine the body and go home.

Jack walked up behind Phil Carter and touched him on the shoulder. Phil turned his blond head and gave Jack a smile of glad surprise. Jack led him in silence to a far corner and talked in a low voice.

"How did he get it, know yet?"

"Not yet, but the consensus is from a heater. The back of his jacket looks charred."

"In the back, eh?"

"What are you doing here, Jack; going to solve it on your own? I heard you got fired."

"I did. No, I don't care who killed him. All I want to know is one thing. Is he a cellular biologist? He's the one who got me fired."

"The devil!"

"That's exclusive. Now look, do something for me. I see Lieutenant Weems is in charge. You're friendly with him, aren't you?"

"Well, not buddy-buddy friendly, but he owes me some favors."

"He's not friendly with me. So you get a list of everything the guy is carrying, every possible scrap. He may have something that will prove his profession. I'll stay over here out of the way."

"Sure, I can do that. See you."

Jack remained in his corner, unnoticed and watchful as the official routine proceeded. He didn't speculate on who had killed Wagner. He didn't much care. Excitement rose in him as objects were removed from the dead man's pockets and itemized. He could identify some of them from where he stood: a notebook, something that might be a pen or a flashlight, wallet and other trivia. No

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sheaf of paper that would indicate a prepared speech.

Jack's heart sank. The guy was on his way to Chicago and the convention. This was obvious. So where was his speech? It seemed an inescapable conclusion that the little man had been killed to prevent that speech from becoming public. By whom, then?

Time enough later to consider that problem. Here came Carter, wearing a puzzled frown.

"Nothing," he said. "All ordinary identification is missing. There wasn't anything in that notebook but one name and address. Dr. Harmon Crane, Medical Center. There was a notation which said he had brought about five cures. Cure of what, or names of patients it didn't say. He had a pass to the Romain Research Laboratories over on Mateo Drive. And that was the works."

"Funny," Jack mused. "Something's way out of focus here, Phil. What did the M. E. say?"

"The guy had been dead about ten hours. He put the time of death around nine this morning. They got one fair print off the locker door. Everything else was wiped clean."

"Well, it isn't a lot, but it's something. Thanks, Phil."

Jack went up to the roof and approached an aircab. As he did so a man swung into step with him.

"You Jack Bland?"

Jack looked into a wide, grim face and a pair of smoldering dark eyes.

"Well?" he snapped. "What is it? I'm in a hurry."

"In a hurry to have something nasty happen to you?"

"Like what happened to Wagner, maybe?"

"I don't know any Wagner. I know just one thing, a tip. I'm passing it on. Keep your nose out of . . . whatever you're doing. That way you stay healthy."

"Just who gave you this tip?"

"Listen, Bland," the man said without expression. "I don't know anything but what I told you. You'll never see me again. I won't be in the picture again. I've told you what to do, and that was my job."

The man turned abruptly and entered the building. "Hey!" Jack called. "Wait a min—"

The man passed through the door without paying any attention to Jack. Jack took a couple of steps after him, but stopped in indecision. No point in going after the guy. It was obvious he'd said his say, and that was all.

What Jack Bland needed to do, he decided, was a little quiet thinking. There was a strong odor about this whole thing, and he had to put it together. Not, he told himself, that he cared about Wagner's death except insofar as it prevented him from getting his job back and marrying Gilda. So he went to Gilda's place to think.

She fixed him a drink and sat on a cushion at his feet as he recapitulated his visit to the airport.

"It looks as if whoever knocked

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him off stole his speech and any other data that might indicate what he was. But why? The stuff has been published. Sure, it's been buried in highly technical journals that only a few people read, but the whole thing is known in the profession. So why suppress it? That's what I don't get."

"Look, darling," Gilda said earnestly. "Why don't you just forget it? You can get another job somewhere. That guy who spoke to you on the roof scares me."

Jack sipped at his drink reflectively. "I must admit I don't feel too easy about him myself, but I sure am curious. Somebody wants this stuff to stay just where it is, almost unknown."

He got to his feet and took a couple of turns about the comfortable room. "It all comes down to what you believe in," he said presently as Gilda followed his pacing with anxious dark eyes. "This thing is right. Whether Wagner was or wasn't a cellular biologist, whether or not he had a degree is beside the point. The main thing is that there's a definitive cure for cancer, and somebody's trying to hush it up. Who would want to do that? Seems to me any decent person would want to shout it to the world. I can't, because my word doesn't carry any weight. I've got to quote somebody who's an authority. And I'm going to, not necessarily if it kills me, but I'm willing to take the initial risk."

"Whoever it is has already killed one man," Gilda pointed out.

"Oh, I know. If things get too tough, I'll have to give up. But they've got to get a lot tougher. I have a couple of leads I'll run down tomorrow, and see what happens."

Jack's first stop the next morning was the Romain laboratories, a large, sprawling outfit that sold drugs and synthesized medications to a large clientele of doctors who were —Jack had been told—not exactly quacks, perhaps, but were barely on the fringes of respectability.

These were men who specialized in long treatments for "incurable" diseases. The bread pill boys, the saline injections, the hearty manner. Politically active.

But Mr. Romain himself was another kettle of fish. His face was thin and cold, his handshake disinterested, his manner curt.

"Well?" he asked, when Jack had taken a chair in the big, antiseptic-looking office.

"I see one of your employees got knocked off last night," Jack said.

"Wagner?" Romain replied without emotion. "He was no employee. He was doing something on his own here. I let him use a small room we had closed."

"What was the research he was engaged in, Mr. Romain?"

Romain shrugged. "I was never interested enough to inquire."

"Isn't it true that he proved the trophoblastic theory on cancer here, with your help?"

"The what?"

"The argument that the tropho-

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blast and the cancer cell are one and the same."

"I don't know what you're talking about."

Jack frowned. "He's had articles published, one in particular that gives the whole thing simply and clearly. Don't you know about it?"

"I do not."

"Mr. Romain, do you expect me to believe that the head of a laboratory like this doesn't know when something important is going on in his place?"

"I don't expect you to believe anything. I don't care. And I'm busy."

"One more question," Jack said as he rose. "Was Wagner a cellular biologist? Did he have a degree?"

"I have no idea. Now, good day."

"Do you know Dr. Harmon Crane?"

"No."

Jack puzzled over the situation on his way to see Dr. Harmon Crane. During the whole of his study of Wagner's thesis, he had been unable to reach the man himself. He didn't even find out whether this was because of shyness or duress. But if someone had been forcing him to be quiet, then who—and why?

Wagner had signed one article as a Ph.D., and Jack had assumed this to be true. But he hadn't—he had to admit it—definitely verified the fact. If a man tells you his name, you accept it. You don't ask for proof, under ordinary circumstances. Same way with a degree.

He felt sure that Romain had been lying to him. But why? It was all very confusing.

He entered the curving pile of stone and plastic that was the Medical Center and was soon facing Dr. Crane in his austere offices. Dr. Crane himself was the very picture of medical respectability. His square face was friendly beneath sleek silvery hair, his gray eyes alert and keen, his handclasp warm and firm. Jack conceived an immediate liking for the man.

"I need some information, doctor. I need it desperately."

Dr. Crane raised white brows. He intermeshed his broad and graceful hands on his desk and waited.

"You're familiar with the standard test for the presence of malignancy, doctor?"

"Well, I know something, but I'm no specialist."

"Well, briefly, you know the old standard Beard test will show a positive reaction in the presence of cancer—or in the early stages of pregnancy?"

"Yes, but I have never heard of any direct connection between the two conditions."

Jack was shocked, and outraged. "You haven't?"

"No-o."

"But how about Wagner's trophoblastic thesis?"

"Whose . . . what?"

Jack felt a slow fury beginning to grow. Dr. Crane, according to Wagner's note, had actually cured patients with the pancreatic extract.

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Jack believed in Wagner. He wanted to believe in the doctor, but here he was getting the old run-around again. O.K., he thought grimly, we're going to play this to the hilt.

"All right, you know, Wagner, the cellular biologist?"

"I'm afraid I haven't the pleasure."

"I don't know what your angle is, doctor," Jack said tightly, "but I'll give you the whole pitch. Maybe you'll tell me then what I want to know."

"Go right ahead, but I have appointments—"

"This won't take long. I'll tell it just as if you never heard of Wagner, or a trophoblast, though I'm certain you could give me cards and spades and do better than I. I'm a layman, and the medical terminology is beyond me. So here goes—

"In the first part of pregnancy, a cell is formed which is called the trophoblast. It is not self-generative; it comes from the diploid-totipotent cell. It multiplies at an almost astronomical rate, and it has one function only, to erode the wall of the uterus so that conceptus can gain a foothold. Then, about the forty-eighth day, its work is done and the pancreas gland releases a substance which kills off all the trophoblasts.

"Now, doctor, the trophoblast *is* the cancer cell."

"Very interesting. This is not just theory?"

You should know, Jack thought savagely. But he held his temper under control.

"As proved by Wagner," Jack went on, "the trophoblast is never found in the human body, aside from the early stages of pregnancy, except in the presence of cancer. It is never found in the human male except in the presence of cancer. It *is* cancer, and the pancreatic secretion will kill it. So—cancer can be cured.

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This has been known for a long time."

Dr. Crane's face was still attentive and friendly, though the eyes were more sharply alert.

"Now," Jack continued, "Wagner got himself killed yesterday on the way to a medical seminar where he was going to present his case. And I keep running into stone walls, just as I have ever since I was tipped off to this. I can't find out anything about him. He was either dodging publicity, or he was being kept out of circulation. What I want to know is why?"

"I'm afraid I can't help you," Dr. Crane murmured.

"I feel certain you can, if you only will. I feel certain that you have treated cancerous conditions and cured them, with this pancreatic extract."

"I'm afraid, young man, that you have been misinformed." The gray eyes were sharper than ever.

"I don't think so," Jack said. "Look, I lost my job over this thing, and I was going to be married today. I've been threatened, told to keep out of it. All I want is to get my job back, but I have to prove Wagner had a degree in biology. I believe you know."

"I'm sorry. I never even heard of Wagner."

Jack sighed. "Well, if that's the way it is—" He got to his feet. "Why would anybody want to suppress the information, doctor? And why doesn't the medical profession get off the dime, at least to investigate?"

"That's a complex question, Mr. Bland. The medical profession as a group is extremely conservative. The reputable members will not use treatment that is not thoroughly proved over a long period of time. This extract you describe must be in the experimental stage, and any doctor using his patients as guinea pigs without their knowledge and consent would soon be ruined."

"I see," Jack broke in. "So that, even if you had used the treatment successfully, you wouldn't admit it."

"I would not."

"But who would want to suppress Wagner's speech?"

"No reputable man would."

"Hm-m-m," Jack mused. "This is beginning to add up. You've given me food for thought, doctor. Thanks."

He went out into the empty corridor, and almost to his death.

His assailant came up behind him noiselessly, and the only thing Jack heard clearly was, "You were told to keep your nose out of this, wise guy." He went down from a blow on the head that seemed to paralyze his optic nerve. He clung desperately to the ragged edge of consciousness during a rain of vicious blows and kicks.

His last conscious thought was: "Somebody's really trying to kill me; I wonder why."

He opened his eyes in a hospital

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bed. A pretty nurse was checking his pulse.

"What—" Jack began in a painful whisper, but the nurse silenced him.

"You're to remain absolutely quiet until the doctor looks you over again. He'll tell you what you want to know."

She gave him a cheerful smile and went out of the white and quiet room. Jack conducted a mental survey of himself.

His head ached. His side ached. His eyes ached. One arm felt as if it were broken—he couldn't wiggle the fingers of his left hand. Actually, he had great difficulty in sorting out individual aches. He seemed to be one solid pain, with minor emphasis here and there.

He fell asleep again. He awoke later, but dropped off in a short while. Opiate, he thought drowsily.

This routine continued, he learned later, for more than forty-eight hours before he felt wide awake. The pretty nurse was checking his pulse again. Broad, stocky Lieutenant Weems stood against the far wall, immobile and sharp-eyed.

"What have I done now?" Jack asked him.

Weems came to the foot of the bed. "How do you feel?"

"Fine. I guess." Jack looked up at the nurse. "How *do* I feel?"

"Well enough, I think, for a fifteen-minute interview, but don't get excited. I'll be back."

"The doc said I could tell you what we know," Weems said when the nurse was gone. "This looks like attempted homicide, that's why I'm here. You've got two cracked ribs, a broken arm, a slight concussion but no fracture of the skull, two very fine black eyes, but, by some miracle, no serious internal injuries. Do you know who did it?"

"No. I didn't see him."

"Him? Only one?"

Jack attempted a shrug, winced. "I don't know. I heard only one." He related what he remembered of the beating. "Then everything went black," he concluded with a wry grin.

Weems made notes. "Got any idea why?"

"I'm pretty sure," Jack said, "but I've got to sort things out first. Anyway, I couldn't tell you in fifteen minutes. Has anybody told Gilda?"

"She knows. She'll be here this afternoon."

"Good. By the way, who's paying for all this?"

"I wouldn't know," Weems said. "You ought to be up and around in a few days. Drop in and see me."

After the nurse had given him an alcohol rub and a cigarette, Jack closed his eyes and reviewed the situation. It was still out of focus, but the blurred edges were not as formless as before, and one resolution was sharp and clear—somebody was going to suffer for this. Not himself. He hoped.

Gilda brought him more cigarettes and some reading matter. She touched the puffed and discolored skin around his eyes with tender fin-

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gers, but her expression was grim.

"Now," she said with finality. "You're going to drop this thing. I'm not going to say I told you so. What's done is done. But there isn't going to be any more. Personally, I care more about you than any hypothetical cure for cancer."

"It isn't hypothetical, baby."

"All right! Suppose it's real. It'll be made public some day, and I want you to be alive to hear it. You're hipped on the subject, and your pride is wounded over losing your job. There are other jobs. And," she added with a twist of her mouth, "you'd better get one."

"Yeah, how about that? Where's the money coming from to pay for all this?"

"From me, naturally, but it's almost gone."

"You're . . . swell, Gilda. I'll pay you back."

"I don't care about the money," she said impatiently. "I'm just glad I had saved it. I want you to get out of here, and we'll get married and forget all about the blasted trophoblasts."

"O.K., dear," Jack said meekly. "From now on it's your party."

He spent the next two days thinking, going over the whole story a step at a time ever since he had entered the picture. One by one the pieces dropped into place, and he decided he knew the complete score. The old fury began to build inside him, and he knew, promise or no promise, what he must do if he were to live in peace with himself.

He was impatient now for his release, and on the fifth day he was allowed to take his bandaged self away. He had lunch with Gilda and dropped in at the *Evening Telenews* to pick up his final check.

Lathrop sent a copy boy after it. "How do you feel?" he asked.

Jack shrugged. "I'll live. Will you tell me who got me fired?"

Lathrop looked distressed. "I can't say a word, Jack."

"You don't have to." Jack shoved copy paper and a pencil in front of the City Editor. "Was it Romain?"

Lathrop hesitated, then wrote, "Yes."

Jack took his check and started his round of job hunting. He received a variety of answers, but they all added up to a definite "No!" He left one call for a desperate last, the Transcon Syndicate. He was admitted without difficulty to the office of Harry Webb, brisk young Managing Editor.

"What happened to you?" Webb asked, indicating the arm.

"Locusts," Jack said. "Look, Harry, I need a job. Any kind of a job. Have you got one?"

"Sorry, Jack. No openings on the staff."

"Well, then, do you know of one, anywhere in the country? Not," he sighed, "that I could find the fare to get anywhere."

Webb was silent in thought for a moment. "Why don't you free-

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lance, Jack? You have a knack for beating competition to the big news. Why don't you go to Washington? I'll take any exclusives you can dig up and give 'em circulation. By-line and personal telecast on the big stuff."

"I like the idea all right," Jack said slowly, "but how do I get there? Can you advance me a hundred bucks?"

Webb shook his head. "You know how tight this outfit is. I could loan you a couple out of my own pocket."

"No thanks, that wouldn't do any good. At that rate I'd have to tap fifty guys, and I don't know that many who have a couple of bucks. But I'll think about it. Maybe I can manage it, somehow. Thanks for the tip."

He went outside and stood indecisively as pedestrians moved past and around him. He was whipped. He had exhausted every resource. He was broke, in the practical sense. He was in debt. All because of—

He shook the thought out of his head. No point in going over that again. Some day he'd get his innings against Romain and whoever he was fronting for. But not now, and there was nothing to be gained by being bitter.

His gaze moved idly past a large building in this group, but snapped back as he took in the significance of the sign: FUTURION, INC.

The idea of a way out of his predicament took form swiftly in his mind, and he went into the building and asked for an appointment with the editor-in-chief. This was a small, intense man with keen blue eyes named Rackham who received Jack with a brief smile and a waved invitation to a seat.

"I don't imagine you know who I am," Jack said, "but I've got something that might interest you."

"I've heard of you," Rackham said.

"As I get it, Mr. Rackham, you publish science-fantasy periodicals and make microstats for shipping and all the other things that go with this business."

"Right."

"And you pay for material?"

"Naturally."

"O.K., I'm going to give you the whole pitch, from the time it began until now."

He told how an Edinburgh professor, in the early days of the twentieth century, had blazed the trail on the trophoblastic concept of cancer.

"Then, as the years passed, other research men added a fact here, a thought there. Wagner correlated all this material, a tremendous job, I imagine. He also got together a list of a thousand or so case histories, ninety percent of which were cured. I got a tip on what he'd done, and—"

He related in detail all that had happened to him. Rackham listened intently, and once asked for clarification of a point.

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"So there it is," Jack concluded. "You can't escape the distasteful fact that a large group of disreputable people are making a lot of money out of treatment and medication, not cures. A cure would shut off their income. I know who's fronting for them, but I have no legal proof and can't get any. However, I'm certain the major part of the medical profession is not involved."

He lit a cigarette and carefully considered his next words.

"Anyway, they've got me whipped. I can't get my job back, I can't get another job here. I've fought these people, but it's punching pillows. I hit the target and it gives, but springs right back into shape. But I've got this chance in Washington, where they won't bother me. So here's my proposition—

"Let me write this story for you. I'll lay it a hundred or so years in the future, soup up the plot a little, disguise all the names and not step on any decent toes. Some day this cure will be announced officially, and it would be a big feather in your cap to have already published it. You'd get thousands of dollars worth of publicity."

"Sounds interesting," Rackham said crisply. "When can you do it?"

"Well, you know how I'm fixed. I have to live meanwhile. Can you advance a hundred dollars, and give me the remainder on delivery of the manuscript?"

Rackham toyed with a paper weight, a polished ball of bronze with one flat surface, and looked at Jack for a long moment. "I'll do it. It's against our policy, but I'll take a chance on you." He gave instructions over the intercom, and Jack looked thoughtfully at the paper weight.

"May I borrow that?" he asked, when Rackham had finished.

"This?" Rackham hefted the weight. "Why, yes. But why?"

Jack turned on a sheepish smile. "Oh, call it superstition."

He took the weight, and his check when it came, and left the building. His first stop was a public visor booth.

Romain's face was on the screen presently. "Again?" he said icily.

"I think you know more about Wagner than you told me," Jack lied, "from some things Dr. Crane said. Do you want to give me the information or do I have to get it from Dr. Crane?"

Romain didn't even sneer. He simply blanked out.

Jack smiled grimly as he took off one of his socks in the booth. He dropped the bronze ball in the sock, put the improvised sap in his pocket, replaced the sandal and went outside.

He made a leisurely trip to the Medical Center, to give Romain plenty of time to arrange another ambush. It had come to him in the hospital that Romain must have been responsible for the beating he'd taken. His own casual question

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about Dr. Crane had tipped Romain as to his next stop.

He had promised Gilda he'd stay out of it. He had to break that promise, had to. And he had to do it on his own. He could just picture Lieutenant Weems' scorn if he, Jack, told the reasons why the man who killed Wagner must be the one who had administered the beating outside Dr. Crane's office.

Imagine Weems trying to wrap his tongue around "trophoblast!"

This time, there would be no ambush. He had a weapon, and would be on the lookout. Let anybody make a funny move and he'd get a lump on his noggin. Then would be the time to holler copper.

He entered Medical Center without incident and went cautiously from the busy foyer to Dr. Crane's floor. His eyes went everywhere, and he moved somewhat as if he were stalking skittish prey. He clutched the open end of the sock in his pocket, ready to swing at the first sign of trouble.

He didn't see the man come up behind him. He was alone in the deserted corridor one instant, the next something hard was jammed in his back, and a remembered voice snarled: "Just keep walking, wise guy. One phony move and you get what Wagner got."

Jack felt fear, chagrin and exultation. He'd been foxed, and he might be killed, but he had been right! This *was* the guy. What he'd said was as good as a confession.

Little good it was going to do, Jack thought ruefully. Now what?

A girl came out of an office ahead of him and walked toward him and the man behind. She was rather pretty, Jack noted idly.

As she came abreast, Jack suddenly said: "Sally! I almost didn't recognize you."

Several things happened as he spoke. The most important was one he had to surmise—that his assailant's eyes would shift to the girl for a fraction of a second. That's all he needed to pivot and swing.

The bronze ball smacked against the man's head as the girl said: "My name's not . . . oh!"

The man, young and stocky, dropped to the floor, the heater falling from his limp hand. Jack picked it up, stepped back and smiled at the girl.

"Thanks. Will you call police headquarters, Lieutenant Weems in Homicide, and ask him to get up here quick?"

"Why . . . yes, I guess so." She turned back toward the door she had come out.

"Will you make one other call?" Jack asked. She stopped. He gave her Gilda's name and number. "Will you ask her to come, too? Tell her we're going to see a man about changing her name."

THE END

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THE EVITABLE CONFLICT

BY ISAAC ASIMOV

Now we've used robots for a long time. In that day a robot wasn't allowed on Earth—if he looked humanoid. But the computing machines were allowed, naturally. The problem was, how could a can't-harm-humans basic command be, apparently, overridden to the ruination of several men?

Illustrated by Orban

The Co-ordinator, in his private study, had that medieval curiosity, a fireplace. To be sure, the medieval man might not have recognized it as such, since it had no functional significance. The quiet, licking flame lay in an insulated recess behind clear quartz.

The logs were ignited at long-distance through a trifling diversion of the energy-beam that fed the public buildings of the city. The same button that controlled the ignition first dumped the ashes of the previous fire, and allowed for the entrance of fresh wood. It was a thoroughly domesticated fireplace, you see.

But the fire itself was real. It was wired for sound, so that you could hear the crackle and, of course, you could watch it leap in the air stream that fed it.

The Co-ordinator's ruddy glass reflected, in miniature, the discreet gamboling of the flame, and, in even further miniature, it was reflected in each of his brooding pupils.

And in the frosty pupils of his guest, Dr. Susan Calvin of U. S. Robots & Mechanical Men Corporation.

The Co-ordinator said: "I did not ask you here entirely for social purposes, Susan."

"I did not think you did, Stephen," she replied.

"And yet I don't quite know how to phrase my problem. On the one hand, it may be nothing at all. On the other, it may mean the end of humanity."

"I have come across so many problems, Stephen, that presented

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the same alternative. I think all problems do."

"Really? Then judge this: World Steel reports an overproduction of twenty thousand long tons. The Mexican Canal is two months behind schedule. The mercury mines at Almaden have experienced a production deficiency since last spring, while the Hydroponics plant at Tientsin has been laying men off. These items happen to come to mind at the moment. There is more of the same sort."

"Are these things serious? I'm not economist enough to trace the fearful consequences of such things."

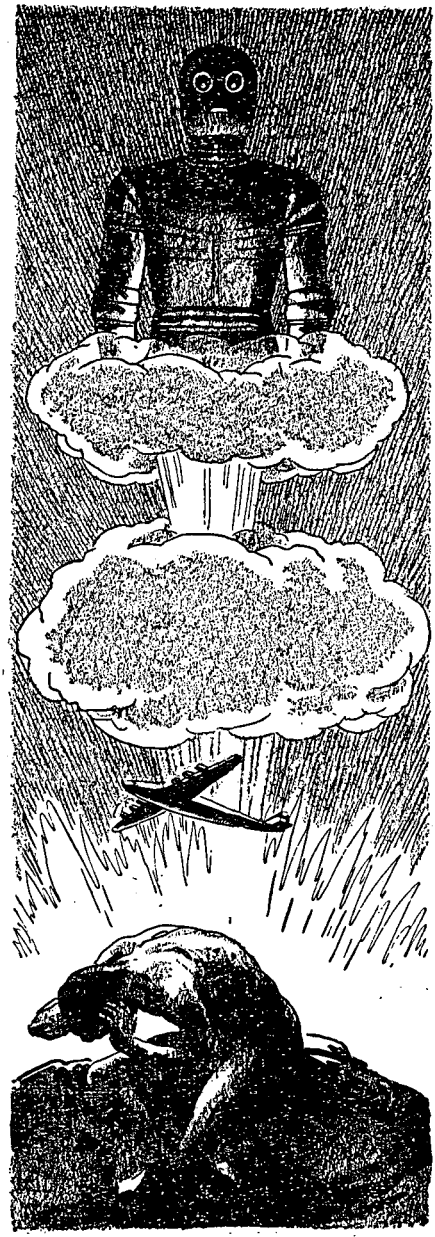
"In themselves, they are not serious. Mining experts can be sent to Almaden, if the situation were to get worse. Hydroponics engineers can be used in Java or in Ceylon, if there are too many at Tientsin. Twenty thousand long tons of steel won't fill more than a few days of world demand, and the opening of the Mexican Canal two months later than the planned date is of little moment. It's the Machines that worry me; I've spoken to your Director of Research about them already."

"To Peter Bogert? He hasn't mentioned anything about it to me."

"I asked him to speak to no one. Apparently, he hasn't."

"And what did he tell you?"

"Let me put that item in its proper place. I want to talk about the Machines first. And I want to talk about them to you, because you're the only one in the world who understands



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robots well enough to help me now. May I grow philosophical?"

"For this evening, Stephen, you may talk how you please and of what you please, provided, you tell me first what you intend to prove."

"That such small unbalances in the perfection of our system of supply and demand, as I have mentioned, may be the first step towards the final war."

"Proceed."

Susan Calvin did not allow herself to relax, despite the designed comfort of the chair she sat in. Her cold, thin-lipped face and her flat, even voice were becoming accentuated with the years. And although Stephen Byerley was one man she could like and trust, the cultivated habits of a lifetime are not easily broken.

"Every period of human development, Susan," said the Co-ordinator, "has had its own particular type of human conflict—its own variety of problem that, apparently, could be settled only by force. And each time, frustratingly enough, force never really settled the problem. Instead, it persisted through a series of conflicts, then vanished of itself . . . what's the expression . . . ah, yes 'not with a bang, but a whimper', as the economic and social environment changed. And then, new problems, and a new series of wars. Apparently endlessly cyclic.

"Consider relatively modern times. There were the series of dynastic wars in the sixteenth to eighteenth centuries, when the most important question in Europe was whether the houses of Hapsburg or Valois-Bourbon were to rule the continent. It was one of those 'inevitable conflicts', since Europe could obviously not exist half one and half the other.

"Except that it did, and no war ever wiped out the one and established the other, until the rise of a new social atmosphere in France in 1789 tumbled first the Bourbons and, eventually, the Hapsburgs down the dusty chute to History's incinerator.

"And in those same centuries there were the more barbarous religious wars, which revolved about the important question of whether Europe was to be Catholic or Protestant. Half and half she could not be. It was 'inevitable' that the sword decide. Except that it didn't. In England, a new industrialism was growing, and on the continent, a new nationalism. Half and half Europe remains to this day and no one cares much.

"In the nineteenth and twentieth centuries, there was a cycle of nationalist-imperialistic wars, when the most important question in the world was which portions of Europe would control the economic resources and consuming capacity of which portions of non-Europe. All non-Europe obviously could not exist part English and part French and part German and so on—until the forces of nationalism spread sufficiently, so that non-Europe ended what all the wars could not, and decided it could

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exist quite comfortably all non-European.

"And so we have a pattern—"

"Yes, Stephen, you make it plain," said Susan Calvin. "These are not very profound observations."

"No. But then, it is the obvious which is so difficult to see most of the time. People say 'It's as plain as the nose on your face.' But how much of the nose on your face can you see, unless someone holds a mirror up to you? In the twentieth century, Susan, we started a new cycle of wars . . . what shall I call them? Ideological wars? The emotions of religion applied to economic systems, rather than to extranatural ones? Again the wars were 'inevitable' and this time there were atomic weapons, so that Mankind could no longer live through its torment to the inevitable wasting-away of the inevitability. And positronic robots came.

"They came in time, and, with it and alongside it, interplanetary travel. So that it no longer seemed so important whether the world was Adam Smith or Karl Marx. Neither made very much sense under the new circumstances. Both had to adapt and they ended in almost the same place."

"A *deus ex machina,* then, in a double sense," said Dr. Calvin, dryly.

The Co-ordinator smiled gently, "I have never heard you pun before, Susan, but you are correct. And yet there was another danger. The ending of every other problem had merely given birth to another. Our new world-wide robot economy may develop its own problem, and for that reason we have the Machines. The Earth's economy is stable, and will *remain* stable, because it is based upon the decisions of calculating machines that have the good of humanity at heart through the overwhelming force of the First Law of Robotics." He recited it almost automatically, and Susan Calvin's lips moved slightly, in time to the words: "No robot may harm a human being; nor, through inaction, may he allow one to come to harm."

Stephen Byerley continued, "And although the Machines are nothing but the vastest conglomeration of calculating circuits ever invented, they are still robots within the meaning of the First Law, and so our Earth-wide economy is in accord with the best interests of Man. The population of Earth knows that there will be no unemployment, no overproduction or shortages. Waste and famine are words in history books. And so the question of ownership of the means of production becomes obsolescent. Whoever owned them—if such a phrase has meaning—a man, a group, a nation, or all mankind, they could be utilized only as the Machines directed. Not because men were forced to, but because it was the wisest course and men knew it.

"It puts an end to war—not only to the last cycle of wars, but to the next and to all of them. Unless—"

A long pause, and Dr. Calvin encouraged him by repetition. "Unless—"

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The fire crouched and skittered along a log, then popped up.

"Unless," said the Co-ordinator, "the Machines don't fulfill their function."

"I see. And that is where those trifling maladjustments come in which you mentioned awhile ago—steel, hydroponics and so on."

"Exactly. Those errors should not be. Dr. Bogert tells me they *cannot* be."

"Does he deny the facts? How unusual!"

"No, he admits the facts, of course. I do him an injustice. What he denies is that any error in the Machine is responsible for the so-called—his phrase—errors in the answers. He claims that the Machine is self-correcting and that it would violate the fundamental laws of nature for an error to exist in the circuits or relays. And so I said—"

"And you said: 'Have your boys check them and make sure, anyway.'"

"Susan, you read my mind. It was what I said, and he said he couldn't."

"Too busy?"

"No, he said that no human could. He was frank about it. He told me, and I hope I understand him properly, that the Machines are a gigantic extrapolation. Thus— A team of mathematicians work several years calculating a positronic brain equipped to do certain similar acts of calculation. Using this brain they make further calculations to create a still more complicated brain, which they use again to make one still more complicated and so on. According to Bogert, what we call the Machines are the result of ten such steps."

"Ye-es, that sounds familiar. Fortunately, I'm not a mathematician. And so poor Peter can no longer understand his creations."

"Apparently not. The Machines are not super-brains in Sunday supplement sense—although they are so pictured in the Sunday supplements. It is merely that in their own particular province of collecting and analyzing a nearly infinite number of data and relationships thereof, in a nearly infinitesimal time, they have progressed beyond the possibility of detailed human control."

A frosty smile parted Susan's lips, "Poor Peter! He succeeded Lanning as Director of Research last summer, and the first major problem presented him is insoluble. But he'll recover, I'm sure."

"And then I tried something else. I actually asked the Machine! In the strictest secrecy, we fed it the original data involved in the steel decision, its own answer, and the actual developments since . . . the overproduction, that is . . . and asked for an explanation of the discrepancy."

"Good, and what was its answer?"

"I can quote you that word for word: 'The matter admits of no explanation.'"

"And how did Peter interpret that?"

"In two ways. Either we had not given the Machine enough data to allow a definite answer, which was un-

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likely. Dr. Bogert admitted that. Or else, it was impossible for the Machine to admit that it could give any answer to data which implied that it could harm a human being. This, naturally, is implied by the First Law. And then Dr. Bogert recommended that I see you."

Susan Calvin looked very tired, "Because I am the Robopsychologist of the Company, the expert on the Robotic Laws, and because that took our dear Peter from under. Ptah!

"Stephen, let me state my position. My researches do indeed involve the interpretation of robot behavior in the light of the Three Laws of Robotics. You have stated the First Law already. The Second Law is as follows: 'All robots must obey the orders of all qualified human beings as long as these orders do not conflict with the First Law.' The Third Law states: 'All robots must protect their own existence as long as such protection does not conflict with the First and Second Laws.'

"Here, now, we have these incredible calculating machines. They are positronic robots and therefore obey the Laws of Robotics. But they lack personality; that is, their functions are extremely limited—must be, since they are so specialized. Therefore, there is very little room for the interplay of the Laws, and my one method of attack is virtually useless. In short, I don't know that I can help you, Stephen."

The Co-ordinator laughed shortly, "Nevertheless, let me tell you the rest. Let me give you *my* theories, and perhaps you will then be able to tell me whether they are possible in the light of Robopsychology."

"By all means. Go ahead."

"Well, since the Machines are giving the wrong answers, then, assuming that they cannot be in error, there is only one possibility. *They are being given the wrong data!* In other words, the trouble is human, and not robotic. So I took my recent planetary inspection tour—"

"From which you have just returned to New York."

"Yes. It was necessary, you see, since there are four Machines, one handling each of the Planetary Regions. And *all four are yielding imperfect results.*"

"Oh, but that follows, Stephen. If any one of the Machines is imperfect, that will automatically reflect in the results of the other three, since each of the others will assume as part of the data on which they base their own decisions, the perfection of the imperfect fourth. With a false assumption, they will yield false answers."

"Uh-huh. So it seemed to me. Now, I have here the records of my interviews with each of the Regional Vice Co-ordinators. Would you look through them with me? Oh, and first, have you heard of the 'Society for Humanity?' "

"Um-m-m, yes. They are an outgrowth of the Fundamentalists who have kept U. S. Robots from ever employing positronic robots on the grounds of unfair labor competition and so on. The 'Society for Hu-

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manity' itself is anti-Machine, is it not?"

"Yes, yes, but— Well, you will see. Shall we begin? We'll start with the Eastern Region."

"As you say—"

The Eastern Region:

a—Area: 7,500,000 *square miles*

b—Population: 1,700,000,000

c—Capital: Shanghai

Ching Hso-lin's great-grandfather had been killed in the Japanese invasion of the old Chinese Republic, and there had been no one beside his dutiful children to mourn his loss or even to know he was lost. Ching Hso-lin's grandfather had survived the civil war of the late forties, but there had been no one beside *his* dutiful children to know or care of that.

And yet Ching Hso-lin was a Regional Vice Co-ordinator, with the economic welfare of half the people of Earth in his care.

Perhaps it was with the thought of all that in mind, that Ching had two maps as the only ornaments of the wall of his office. One was an old hand-drawn affair tracing out an acre or two of land, and marked with the now-outmoded pictographs of old China. A little creek trickled aslant the faded markings and there were the delicate pictorial indications of lowly huts, in one of which Ching's grandfather had been born.

The other map was a huge one, sharply delineated, with all markings in neat Cyrillic characters. The red boundary that marked the Eastern Region swept within its grand confines all that had once been China, India, Burma, Indo-china, and Indonesia. On it, within the old province of Szechuan, so light and gentle that none could see it, was the little mark placed there by Ching which indicated the location of his ancestral farm.

Ching stood before these maps as he spoke to Stephen Byerley in precise English, "No one knows better than you, Mr. Co-ordinator, that my job, to a large extent, is a sinecure. It carries with it a certain social standing, and I represent a convenient focal point for administration, but otherwise it is the Machine! The Machine does all the work. What did you think, for instance, of the Tientsin Hydroponics works?"

"Tremendous!" said Byerley.

"It is but one of dozens, and not the largest. Shanghai, Calcutta, Batavia, Bangkok— They are widely spread and they are the answer to feeding the billion and three quarters of the East."

"And yet," said Byerley, "you have an unemployment problem there at Tientsin. Can you be overproducing? It is incongruous to think of Asia as suffering from too much food."

Ching's dark eyes crinkled at the edges. "No. It has not come to that yet. It is true that over the last few months, several vats at Tientsin have been shut down, but it is nothing serious. The men have been released only temporarily and those who do not care to work in other fields have

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been shipped to Colombo in Ceylon, where a new plant is being put into operation."

"But why should the vats be closed down?"

Ching smiled gently, "You do not know much of hydroponics, I see. Well, that is not surprising. You are a Northerner, and there soil farming is still profitable. It is fashionable in the North to think of hydroponics, when it is thought of at all, as a device for growing turnips in a chemical solution, and so it is—in an infinitely complicated way.

"In the first place, by far the largest crop we deal with—and the percentage is growing—is yeast. We have upwards of two thousand strains of yeast in production and new strains are added monthly. The basic food-chemicals of the various yeasts are nitrates and phosphates among the inorganics together with proper amounts of the trace metals needed, down to the fractional parts per million of boron and molybdenum which are required. The organic matter is mostly sugar mixtures derived from the hydrolysis of cellulose, but, in addition, there are various food factors which must be added.

"For a successful hydroponics industry—one which can feed seventeen hundred million people—we must engage in an immense reforestation program throughout the East; we must have huge wood-conversion plants to deal with our southern jungles; we must have power, and steel, and chemical synthetics above all."

"Why the last, sir?"

"Because, Mr. Byerley, these strains of yeast have each their peculiar properties. We have developed, as I said, two thousand strains. The beefsteak you thought you ate today was yeast. The frozen fruit confection you had for dessert was iced yeast. We have filtered yeast juice with the taste, appearance, and all the food value of milk.

"It is flavor, more than anything else, you see, that makes yeast-feeding popular, and for the sake of flavor we have developed artificial, domesticated strains that can no longer support themselves on a basic diet of salts and sugar. One needs biotin; another needs pteroylglutamic acid; still others need seventeen different amino-acids supplied them as well as all the Vitamins B, but one—and yet it is popular and we cannot, with economic sense, abandon it—"

Byerley stirred in his seat, "To what purpose do you tell me all this?"

"You asked me, sir, why men are out of work in Tientsin. I have a little more to explain. It is not only that we must have these various and varying foods for our yeast; but their remain the complicating factor of popular fads with passing time; and of the possibility of the development of new strains with new requirements and new popularity. All this must be foreseen, and the Machine does the job—"

"But not perfectly."

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"Not very *im*perfectly, in view of the complications I have mentioned. Well, then, a few thousand workers in Tientsin are temporarily out of a job. But, consider this, the amount of waste in this past year—waste, that is, in terms of either defective supply or defective demand—amounts to not one-tenth of one percent of our total productive turnover. I consider that—"

"Yet in the first years of the Machine, the figure was nearer one-thousandth of one percent."

"Ah, but in the decade since the Machine began its operations in real earnest, we have made use of it to increase our old pre-Machine yeast industry twenty-fold. You expect imperfections to increase with complications, though—"

"Though?"

"There *was* the curious instance of Rama Vrasayana."

"What happened to him?"

"Vrasayana was in charge of a brine-evaporation plant for the production of iodine, with which yeast can do without, but human beings not. His plant was forced into receivership."

"Really? And through what agency?"

"Competition, believe it or not. In general, one of the chiefest functions of the Machine's analyses is to indicate the most efficient distribution of our producing units. It is obviously faulty to have areas insufficiently serviced, so that transportation costs account for too great a percentage

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of the overhead. Similarly, it is faulty to have an area too well serviced, so that factories must be run at lowered capacities, or else compete harmfully with one another. In the case of Vrasayana, another plant was established in the same city, and with a more efficient extracting system."

"The Machine permitted it?"

"Oh, certainly. That is not surprising. The new system is becoming widespread. The surprise is that the Machine failed to warn Vrasayana to renovate or combine. Still, no matter. Vrasayana accepted a job as engineer in the new plant, and if his responsibility and pay are now less, he is not actually suffering. The workers found employment easily; the old plant has been converted to . . . something-or-other. Something useful. We left it all to the Machine."

"And otherwise you have no complaints."

"None!"

The Tropic Region:
a—Area: 22,000,000 *square miles*
b—Population: 500,000,000
c—Capital: Capital City

The map in Lincoln Ngoma's office was far from the model of neat precision of the one in Ching's Shanghai dominion. The boundaries of Ngoma's Tropic Region were stenciled in dark, wide brown and swept about a gorgeous interior labeled "jungle" and "desert" and "Here be Elephants and all Manner of Strange Beasts."

It had much to sweep, for in land area the Tropic Region inclosed most of two continents: all of South America north of Argentina and Chile, and all of Africa south of the Atlas. It included North America south of the Rio Grande as well, and even Arabia and Iran in Asia. It was the reverse of the Eastern Region. Where the ant hives of the Orient crowded half of Humanity into fifteen percent of the land mass, the Tropics stretched its fifteen percent of Humanity over nearly half of all the land in the world.

But it was growing. It was the one Region whose population increase through immigration exceeded that through births. And for all who came it had use.

To Ngoma, Stephen Byerley seemed like one of these immigrants, a pale searcher for the creative work of carving a harsh environment into the softness necessary for man, and he felt some of that automatic contempt of the strong man born to the strong Tropics for the unfortunate pallards of the colder suns.

The Tropics had the newest capital city on Earth, and it was called simply that: "Capital City", in the sublime confidence of youth. It spread brightly over the fertile uplands of Nigeria and outside Ngoma's windows, far below, was life and color; the bright, bright sun and the quick, drenching showers. Even the squawking of the rainbowed birds was brisk and the stars were hard pin points in the sharp night.

Ngoma laughed. He was a big,

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dark man, strong-faced and handsome.

"Sure," he said, and his English was colloquial and mouthfilling "the Mexican Canal is overdue. What the hell? It will get finished just the same, old boy."

"It was doing well up to the last half year."

Ngoma looked at Byerley and slowly crunched his teeth over the end of a big cigar, spitting out one end and lighting the other, "Is this an official investigation, Byerley? What's going on?"

"Nothing. Nothing at all. It's just my function as Co-ordinator to be curious."

"Well, if it's just that you're filling in a dull moment, the truth is that we're always short on labor. There's lots going on in the Tropics. The Canal is only one of them—"

"But doesn't your Machine predict the amount of labor available for the Canal—allowing for all the competing projects?"

Ngoma placed one hand behind his neck and blew smoke rings at the ceiling, "It was a little off."

"I see. Is it often a little off?"

"Not oftener than you would expect. We don't expect too much of it, Byerley. We feed it data. We take its results. We do what it says. But it's just a convenience; just a labor-saving device. We could do without it, if we had to. Maybe not as well. Maybe not as quickly. But we'd get there.

"We've got confidence out here, Byerley, and that's the secret. Confidence! We've got new land that's been waiting for us for thousands of years, while the rest of the world was being ripped apart in the lousy fumblings of pre-atomic time. We don't have to eat yeast like the Eastern boys, and we don't have to worry about the stale dregs of the last century like you Northerners.

"We've wiped out the tsetse fly and the Anopheles mosquito, and people find they can live in the sun and like it, now. We've thinned down the jungles and found soil; we've watered the deserts and found gardens. We've got coal and oil in untouched fields, and minerals out of count.

"Just step back. That's all we ask the rest of the world to do. Step back, and let us work."

Byerley said, prosaically, "But the Canal—it was on schedule six months ago. What happened?"

Ngoma spread his hands, "Labor troubles." He felt through a pile of papers skeltered about his desk and gave it up.

"Had something on the matter here," he muttered, "but never mind. There was a work shortage somewhere in Mexico once on the question of women. There weren't enough women in the neighborhood. It seemed no one had thought of feeding sexual data to the Machine."

He stopped to laugh, delightedly, then sobered, "Wait a while, I think I've got it. Villafranca!"

"Villafranca?"

"Francisco Villafranca. He was

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the engineer in charge. Now let me straighten it out. Something happened and there was a cave-in. Right. Right. That was it. Nobody died, as I remember, but it made a mess. Quite a scandal."

"Oh?"

"There was some mistake in his calculations. Or at least, the Machine said so. They fed through Villafranca's data, assumptions, and so on. The stuff he had started with, you know. The answers came out differently. It seems the answers Villafranca had used didn't take account of the effect of a heavy rainfall on the contours of the cut. Or something like that. I'm not an engineer, you understand.

"Anyway, Villafranca put up a devil of a squawk. He claimed the Machine's answer had been different the first time. That he had followed the Machine faithfully. Then he quit! We offered to hold him on—reasonable doubt, previous work satisfactory, and all that—in a subordinate position, of course—had to do that much—mistakes can't go unnoticed—bad for discipline— Where was I?"

"You offered to hold him on."

"Oh, yes. He refused. Well, take all in all, we're two months behind. But, that's nothing."

Byerley stretched out his hand and let the fingers tap lightly on the desk, "Villafranca blamed the Machine, did he?"

"Well, he wasn't going to blame himself, was he? Let's face it; human nature is an old friend of ours. Besides, I remember something else now: Why can't I find a document when I want it? My filing system isn't worth a damn— This Villafranca was a member of one of your Northern organizations. Mexico is too close to the North, that's part of the trouble."

"Which organization are you speaking of?"

"The Society for Humanity, they call it. He used to attend the annual conferences in New York, Villafranca did. Bunch of crackpots, but harmless. They don't like the Machines; claim they're destroying human initiative. So naturally Villafranca would blame the Machine. Don't understand that group myself. Does Capital City look as if the human race were running out of initiative?"

And Capital City stretched out in golden glory under a golden sun—the newest and youngest creation of *Homo metropolis.*

The European Region:
a—Area: 4,000,000 *square miles*
b—Population: 300,000,000
c—Capital: Geneva

The European Region was an anomaly in several ways. In area, it was far the smallest; not one fifth the size of the Tropic Region in area, and not one fifth the size of the Eastern Region in population. Geographically, it was only somewhat similar to pre-Atomic Europe, since it excluded what had once been European Russia and what had once been the British Isles, while it in-

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cluded the Mediterranean coasts of Africa and Asia, and, in a queer jump across the Atlantic, Argentina, Chile, and Uruguay as well.

Nor was it likely to improve its relative status vis-a-vis the other regions of Earth, except for what vigor the South American provinces lent it. Of all the Regions, it alone showed a positive population decline over the past half century. It alone had not seriously expanded its productive facilities, nor offered anything radically new to human culture.

"Europe," said Madam Szegeczowska, in her soft French, "is essentially an economic appendage of the Northern Region. We know it, and it doesn't matter."

And as though in resigned acceptance of a lack of individuality, there was no map of Europe on the wall of the Madam Co-ordinator's office.

"And yet," pointed out Byerley, "you have a Machine of your own, and you are certainly under no economic pressure from across the ocean."

"A Machine! Bah!" She shrugged her delicate shoulders, and allowed a thin smile to cross her little face as she tamped out a cigarette with long fingers. "Europe is a sleepy place. And such of our men as do not manage to emigrate to the Tropics are tired and sleepy along with it. You see for yourself that it is myself, a poor woman, to whom falls the task of being Vice Co-ordinator. Well, fortunately, it is not a difficult job, and not much is expected of me.

"As for the Machine— What can it say but 'Do this and it will be best for you.' But what is best for us? Why, to be an economic appendage of the Northern Region.

"And is it so terrible? No wars! We live in peace—and it is pleasant after seven thousand years of war. We are old, monsieur. In our borders, we have the regions where Occidental civilization was cradled. We have Egypt and Mesopotamia; Crete and Syria; Asia Minor and Greece. But old age is not necessarily an unhappy time. It can be a fruition—"

"Perhaps you are right," said Byerley, affably. "At least the tempo of life is not as intense as in the other Regions. It is a pleasant atmosphere."

"Is it not? Tea is being brought, monsieur. If you will indicate your cream and sugar preferences, please. Thank you."

She sipped gently, then continued, "It *is* pleasant. The rest of Earth is welcome to the continuing struggle. I find a parallel here; a very interesting one. There was a time when Rome was master of the world. It had adopted the culture and civilization of Greece; a Greece which had never been united, which had ruined itself with war, and which was ending in a state of decadent squalor. Rome united it, brought it peace and let it live a life of secure non-glory. It occupied itself with its philosophies and its art, far from the clash of growth and war. It was a sort of death, but it was restful, and it lasted

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with minor breaks for some four hundred years."

"And yet," said Byerley, "Rome fell eventually, and the opium dream was over."

"There are no longer barbarians to overthrow civilization."

"We can be our own barbarians, Madam Szegeczowska. Oh, I meant to ask you. The Almaden mercury mines have fallen off quite badly in production. Surely the ores are not declining more rapidly than anticipated?"

The little woman's gray eyes fastened shrewdly on Byerley, "Barbarians . . . the fall of civilization . . . possible failure of the Machine. Your thought processes are very transparent, monsieur."

"Are they?" Byerley smiled. "I see that I should have had men to deal with as hitherto. You consider the Almaden affair to be the fault of the Machine?"

"Not at all, but I think you do. You, yourself, are a native of the Northern Region. The Central Coordination Office is at New York. And I have noticed for quite a while that you Northerners lack somewhat of faith in the Machine."

"We do?"

"There is your 'Society for Humanity' which is strong in the North, but naturally fails to find many recruits in tired, old Europe, which is quite willing to let feeble Humanity alone for a while. Surely, you are one of the confident North and not one of the cynical old continent."

"This has a connection with Almaden?"

"Oh, yes, I think so. The mines are in the control of Consolidated Cinnabar, which is certainly a Northern company, with headquarters at Nikolaevsk. Personally, I wonder if the Board of Directors have been consulting the Machine at all. They said they had in our conference last month, and, of course, we have no evidence that they did not, but I wouldn't take the word of a Northerner in this matter—no offense intended—under any circumstances. Nevertheless, I think it will have a fortunate ending."

"In what way, my dear madam?"

"You must understand that the economic irregularities of the last few months, which, although small as compared with the great storms of the past, are quite disturbing to our peace-drenched spirits, have caused considerable restiveness in the Spanish province. I understand that Consolidated Cinnabar is selling out to a group of native Spaniards. It is consoling. If we are economic vassals of the North, it is humiliating to have the fact advertised too blatantly. And our people can be better trusted to follow the Machine."

"Then you think there will be no more trouble?"

"I am sure there will not be—in Almaden, at least."

The Northern Region:
a—Area: 18,000,000 *square miles*
b—Population: 800,000,000
c—Capital: Ottawa

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The Northern Region, in more ways than one, was at the top. This was exemplified quite well by the map in the Ottawa office of Vice Co-ordinator Hiram Mackenzie, in which the North Pole was centered. Except for the enclave of Europe with its Scandinavian and Icelandic regions, all the Arctic area was within the Northern Region.

Roughly, it could be divided into two major areas. To the left on the map was all of North America above the Rio Grande. To the right was included all of what had once been the Soviet Union. Together these areas represented the centered power of the planet in the first years of the Atomic Age. Between the two was Great Britain, a tongue of the Region licking at Europe. Up at the top of the map, distorted into odd, huge shapes, were Australia and New Zealand, also member provinces of the Region.

Not all the changes of the past decades had yet altered the fact that the North was the economic ruler of the planet.

There was almost an ostentatious symbolism thereof in the fact that of the official Regional maps Byerley had seen, Mackenzie's alone showed all the Earth, as though the North feared no competition and needed no favoritism to point up its pre-eminence.

"Impossible," said Mackenzie, dourly, over the whiskey. "Mr. Byerley, you have had no training as a robot technician, I believe."

"No, I have not."

"Hm-m-m. Well, it is, in my opinion, a sad thing that Ching, Ngoma, and Szegeczowska haven't either. There is too prevalent an opinion among the peoples of Earth that a Co-ordinator need only be a capable organizer, a broad generalizer, and an amiable person. These days he should know his robotics as well—no offense intended."

"None taken. I agree with you."

"I take it, for instance, from what you have said already, that you worry about the recent trifling dislocations in world economy. I don't know what you suspect, but it has happened in the past that people—who should have known better—wondered what would happen if false data were fed into the Machine."

"And what would happen, Mr. Mackenzie?"

"Well," the Scotsman shifted his weight and sighed, "All collected data goes through a complicated screening system which involves both human and mechanical checking, so that the problem is not likely to arise. But let us ignore that. Humans are fallible, also corruptible, and ordinary mechanical devices are liable to mechanical failure.

"The real point of the matter is that what we call a 'wrong datum' is one which is inconsistent with all other known data. It is our only criterion of right and wrong. It is the Machine's as well. Order it, for instance, to direct agricultural activity on the basis of an average July temperature in Iowa of fifty-

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seven degrees Fahrenheit, and it won't accept that. It will not give an answer. Not that it has any prejudice against that particular temperature, or that an answer is impossible; but because, in the light of all the other data fed it over a period of years, it knows that the probability of an average July temperature of fifty-seven is virtually nil. It rejects that datum.

"The only way a 'wrong datum' can be forced on the Machine is to include it as part of a self-consistent whole, all of which is subtly wrong in a manner either too delicate for the Machine to detect or outside the Machine's experience. The former is beyond human capacity, and the latter is almost so, and is more nearly so as the Machines' experience increases by the second."

Stephen Byerley placed two fingers on the table, "Then the Machine cannot be tampered with—And how do you account for recent errors, then?"

"My dear Byerley, I see that you instinctively follow that great error—that the Machine knows all. Let me cite you a case from my personal experience. The cotton industry engages experienced buyers who purchase cotton. Their procedure is to

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pull a turf of cotton out of a random bale of a lot. They will look at that tuft and feel it, tease it out, listen to the crackling perhaps as they do so, touch it with their tongue—and through this procedure they will determine the class of cotton the bales represent. There are about a dozen such classes. As a result of their decisions, purchases are made at certain prices, blends are made in certain proportions. Now these buyers cannot yet be replaced by the Machine."

"Why not? Surely the data involved is not too complicated for it?"

"Probably not. But what data is this you refer to? No textile chemist knows exactly what it is that the buyer tests when he feels a tuft of cotton. Presumably there's the average length of the threads, their feel, the extent and nature of their slickness, the way they hang together and so on. Several dozen items, subconsciously weighed, out of years of experience. But the *quantitative* nature of these tests are not known; maybe even the nature of some of them are not known. So we have nothing to feed the Machine. Nor can the buyers explain their own judgment. They can only say, 'Well, look at it. Can't you *tell* it's class-such-and-such.'"

"I see."

"There are innumerable cases like that. The Machine is only a tool after all, which can help Humanity progress faster by taking some of the burdens of calculations and interpretations off his back. The task of the human brain remains what it has always been; that of discovering new data to be analyzed, and of devising new concepts to be tested. A pity the Society for Humanity won't understand that."

"They are against the Machine?"

"They would be against mathematics or against the art of writing if they had lived at the appropriate time. These reactionaries of the Society claim the Machine robs man of his soul. I notice that capable men are still at a premium in our society—we still need the man who is intelligent enough to think of the proper questions to ask. Perhaps if we could find enough of such, these dislocations you worry about, Co-ordinator, wouldn't occur."

Earth (including the uninhabited continent, Antarctica)

a—Area: 54,000,000, *square miles*
b—Population: 3,300,000,000
c—Capital: New York

The fire behind the quartz was weary now, and sputtered its reluctant way to death.

The Co-ordinator was somber, his mood matching the sinking flame.

"They all minimize the state of affairs." His voice was low. "Is it not easy to imagine that they all laugh at me. And yet—Peter Bogert said the Machines cannot be out of order, and I must believe him. Hiram Mackenzie says they cannot be fed false data, after all, and

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I must believe him. But the Machines are going wrong, somehow, and I must believe that, too—and so there is *still* an alternative left."

He glanced sidewise at Susan Calvin, who, with closed eyes, for a moment seemed asleep.

"What is that?" she asked, prompt to her cue, nevertheless.

"Why, that correct data is indeed given, and correct answers are indeed received, but that they are then ignored. There is no way the Machine can enforce obedience to its dictates."

"Madam Szegeczowska hinted as much, with reference to Northerners in general, it seems to me."

"So she did."

"And what purpose is served by disobeying the Machine? Let's consider motivations."

"It's obvious to me, and should be to you. It is a matter of rocking the boat, deliberately. There can be no serious conflicts on Earth—in which one group or another can seize more power than it has for what it thinks is its own good, despite the harm to Mankind as a whole—while the Machines rule. If popular faith in the Machines can be destroyed to the point where they are abandoned, it will be the law of the jungle again. And not one of the four regions can be freed of the suspicion of wanting just that.

"The East has half of humanity within its borders, and the Tropics more than half of Earth's resources. Each can feel itself the natural rulers of all Earth, and each has a history of humiliation by the North, for which it can be human enough to wish a senseless revenge. Europe has a tradition of greatness, on the other hand. It once *did* rule the Earth, and there is nothing so eternally adhesive as the memory of power.

"Yet, in another way, it's hard to believe. Both the East and the Tropics are in a state of enormous expansion within their own borders. Both are climbing incredibly. They cannot have the spare energy for military adventures. And Europe can have nothing but its dreams. It is a cipher, militarily."

"So, Stephen," said Susan, "you leave the North."

"Yes," said Byerley, energetically, "I do. The North is now the strongest, and has been for nearly a century, or its component parts have been. But it is losing relatively, now. The Tropic Regions may take their place in the forefront of civilization for the first time since the Pharaohs, and there are Northerners who fear that.

"The 'Society for Humanity' is a Northern organization, primarily, you know, and they make no secret of not wanting the Machines. Susan, they are few in numbers, but it is an association of powerful men. Heads of factories; directors of industries and agricultural combines who hate to be what they call 'the Machine's office boy' belong to it. Men with ambition belong to it.

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Men who feel themselves strong enough to decide for themselves what is best for themselves, and not just to be told what is best for others.

"In short, just those men who, by together refusing to accept the decisions of the Machine, can, in a short time, turn the world topsy-turvy—just those belong to the Society.

"Susan, it hangs together. Five of the Directors of World Steel are members, and World Steel suffers from overproduction. Consolidated Cinnabar, which mined mercury at Almaden, was a Northern concern. Its books are still being investigated, but one, at least, of the men concerned was a member. Francisco Villafranca, who, single-handed, delayed the Mexican Canal for two months, was a member, we know already—and so was Rama Vrasayana, I was not at all surprised to find out."

Susan said, quietly: "These men, I might point out, have all done badly—"

"But naturally," interjected Byerley. "To disobey the Machine's analyses is to follow a non-optimal path. Results are poorer than they might be. It's the price they pay. They will have it rough now but in the confusion that eventually follow—"

"Just what do you plan doing, Stephen?"

"There is obviously no time to lose. I am going to have the Society outlawed, every member removed from any responsible post. And all executive and technical positions, henceforward, will be filled only by applicants signing a non-Society oath. It will mean a certain surrender of basic civil liberties but I am sure the Congress—"

"It won't work!"

"What! Why not?"

"I will make a prediction. If you try any such thing, you will find yourself hampered at every turn. You will find it impossible to carry out. You will find your every move in that direction will result in trouble."

Byerley was taken aback, "Why do you say that? I was rather hoping for your approval in this matter."

"You can't have it as long as your actions are based on a false premise. You admit the Machine can't be wrong, and can't be fed wrong data. I will now show you that it cannot be disobeyed, either, as you think is being done by the Society."

"*That* I don't see at all."

"Then listen. Every action by any executive which does not follow the exact directions of the Machine he is working with becomes part of the data for the next problem. The Machine, therefore, knows that the executive has a certain tendency to disobey. He can incorporate that tendency into that data—even quantitatively, that is, judging exactly

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how much and in what direction disobedience would occur. Its next answers would be just sufficiently biased so that after the executive concerned disobeyed, he would have automatically corrected those answers to optimal directions. The Machine *knows,* Stephen!"

"You can't be sure of all this. You are guessing."

"It is a guess based on a lifetime's experience with robots. You had better rely on such a guess, Stephen."

"But then what is left? The Machines themselves are correct and the premises it works on are correct. That we have agreed on. Now you say that it cannot be disobeyed. Then what is wrong?"

"You have answered yourself. *Nothing is wrong!* Think about the Machines for a while, Stephen. They are robots, and they follow the First Law. You quoted that earlier in the evening: 'No robot may harm a human being; nor, through inaction, may he allow one to come to harm.' And since the Machines work not for any single human being, but for all humanity, the First Law becomes: 'No Machine may harm Humanity; nor, through inaction, may he allow Humanity to come to harm.'

"Very well, then, Stephen, what harms Humanity? Economic dislocations most of all, from whatever cause. Wouldn't you say so?"

"I would."

"And what is most likely in the future to cause economic dislocations? Answer that, Stephen."

"I should say," replied Byerley, unwillingly, "the destruction of the Machines."

"And so should I say, and so should the Machines say. Their first care, therefore, is to preserve themselves, for us. And so they are quietly taking care of the only elements left that threatened them. It is not the 'Society for Humanity' which is shaking the boat so that the Machines may be destroyed. You have been looking at the reverse of the picture. Say rather that the Machine is shaking the boat—*very* slightly—just enough to shake loose those few which cling to the side for purposes the Machines consider harmful to Humanity.

"So Vrasayana loses his factory and gets another job where he can do no harm—he is not badly hurt, he is not rendered incapable of earning a living, for the Machine cannot harm a human being more than minimally, and that only to save a greater number. Consolidated Cinnabar loses control at Almaden. Villafranca is no longer a civil engineer in charge of an important project. And the directors of World Steel are losing their grip on the industry—or will."

"But you don't really know all this," insisted Byerley, distractedly. "How can we possibly take a chance on your being right."

"You must. Do you remember the Machine's own statement when you

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presented the problem to him. It was: 'The matter admits of no explanation.' The Machine did not say there was no explanation, or that it could determine no explanation. It simply was not going to *admit* any explanation. In other words, it would be harmful to humanity to have the explanation known, and that's why we can only guess—and keep on guessing."

"But how can the explanation do us harm? Assume that you are right, Susan."

"Why, Stephen, if I am right, it means that the Machine is conducting our future for us not only simply in direct answer to our direct questions, but in general answer to the world situation and to human psychology as a whole. And to know that may make us unhappy and may hurt our pride. The Machine cannot, *must* not, make us unhappy."

"Stephen, how do *we* know what the ultimate good of Humanity will entail? We haven't at *our* disposal the infinite factors that the Machine has at *its!* Perhaps, to give you a not unfamiliar example our entire technical civilization has created more unhappiness and misery than it has removed. Perhaps an agrarian or pastoral civilization, with less culture and less people would be better. If so, the Machine must move in that direction, preferably without telling us, since in our ignorant prejudices we only know that what we are used to, is good—and we would then fight it. Or perhaps a complete urbanization, or a completely caste-ridden society, or complete anarchy, is the answer. We don't know. Only the Machines know, and they are going there and taking us with them."

"But you are telling me, Susan, that the 'Society for Humanity' is right; and that Mankind *has* lost its own say in its future."

"It never had any, really. It was always at the mercy of economic and sociological forces it did not understand—at the whims of climate, and the fortunes of war. Now the Machines understand these forces; and no one can stop them, since the Machines will deal with objectors as they are now dealing with the Society—having, as they do, that greatest of weapons at their disposal, the absolute control of our economy."

"How horrible!"

"Perhaps how wonderful! Think, that for all time, all conflicts are finally evitable. Only the Machines, from now on, are inevitable!"

And the fire behind the quartz went out and only a curl of smoke was left to indicate its place.

THE END

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THE MAZE

BY FRANK M. ROBINSON

The psychological experimenters have long used mazes to test animal intelligence. But this was a new, and very, very effective kind.

Illustrated by Miller

"Civil Service will be looking for you—in fifteen days," he said.

"We'll be lucky if we're still alive in fifteen days," I said grimly.

"That's what I like about you, Bob—always the optimist."

I shrugged. "You know how it will turn out in the end. The pity of it is we have to keep trying. To give up would classify us as being stupid. And we can't afford to look stupid, can we?"

He started cracking his knuckles until my nerves felt like they do when you scratch a blackboard with your fingernails.

"You've been through the maze three times now," he said.

"I know." It was hot in the cube but right then I felt cold as ice.

Camden and I sat on the ground, leaning back against the glassite walls of the cube. The light filtering through made us look like seasick sailors. I felt tired.

Suddenly there was a plucking at my mind, an insistent urge to remember—to remember back to the first day of my vacation. Another trip through the maze was due. I knew how it would start—but how would it end this time?

It would start out like days usually do on Venus—terrible.

I yawned and brushed the sweat off my forehead. Morning on Venus is always the same. Wake up with a thick head and a short temper and a damp feeling in the hollows of the bed where little puddles of sweat had collected. I yawned again, rolled over on the soggy sheet, and tried to catch a few more minutes of sleep.

The insistent buzzing of the visor wouldn't let me. I switched on "voice" and buried my head under the pillow.

"Robert Germaine? This is the Bureau of Assassination Informa-

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tion. Acknowledge, please."

My heart did a sudden thump and I was wide awake.

"This is Germaine," I said.

The caller continued. "Notification of Intent to Asassinate victim Robert Germaine. Marcus Kennedy III registered with the Bureau his intent to assassinate the above named person beginning at noon on the 23rd day of May. Cause: the attentions of the secretary Janet Chandler." He faded from the screen and the set went dead.

It was perfectly legal—if I could kill Kennedy before he got me, they'd never convict me of murder. And vice versa for Kennedy. There was only one slight catch. I was practically fresh from Earth, with no more friends than I could count on the fingers of one hand. Kennedy was rich, influential, and powerful. He could afford a bodyguard. And if I did knock him off, one of his friends would register their intent with the Bureau. I couldn't win.

Abruptly, I tried to minimize Kennedy and the notice. I couldn't afford to let myself get scared—a mind paralyzed by fear would be nothing but a handicap in trying to outwit Kennedy.

Funny, I thought, wake up the first morning of my vacation and have an assassination notice staring me in the face. It was almost as if I hadn't awakened at all and the whole thing was just part of a nightmare I was having.

I took a cold shower, toweled myself, and put on my shorts. That was the only good thing about the planet—just put on your undies and you were dressed for the day. Guys like me who did publicity work for the Venus Colonial Office played up the informality of daily dress for all that it was worth, but it never did counterbalance the planet's many failings.

I looked at my watch. I had three hours before noon—and there *was* an obvious step I could take before then.

I went back to the visor and dialed a number. A portly looking businessman came on the screen.

"Acme Protection Service at *your* service, sir."

"What would be the charge for the assassination of Marcus Kennedy III?"

"One moment please." He came back with a thick ledger and began flipping through it. "One million dollars would be our charge for Kennedy. One half down, which would be nonreturnable, and the other half upon successful completion of the murder."

"What are the statistical chances of success?"

He clucked sympathetically. "Nine point three percent. His bodyguard is well trained."

"How about straight protection for me?"

"Protection for the legal thirty-day assassination period would be a thousand dollars a day. You understand that this includes food tasters and the immediate services of a reputable physician in case of trouble."

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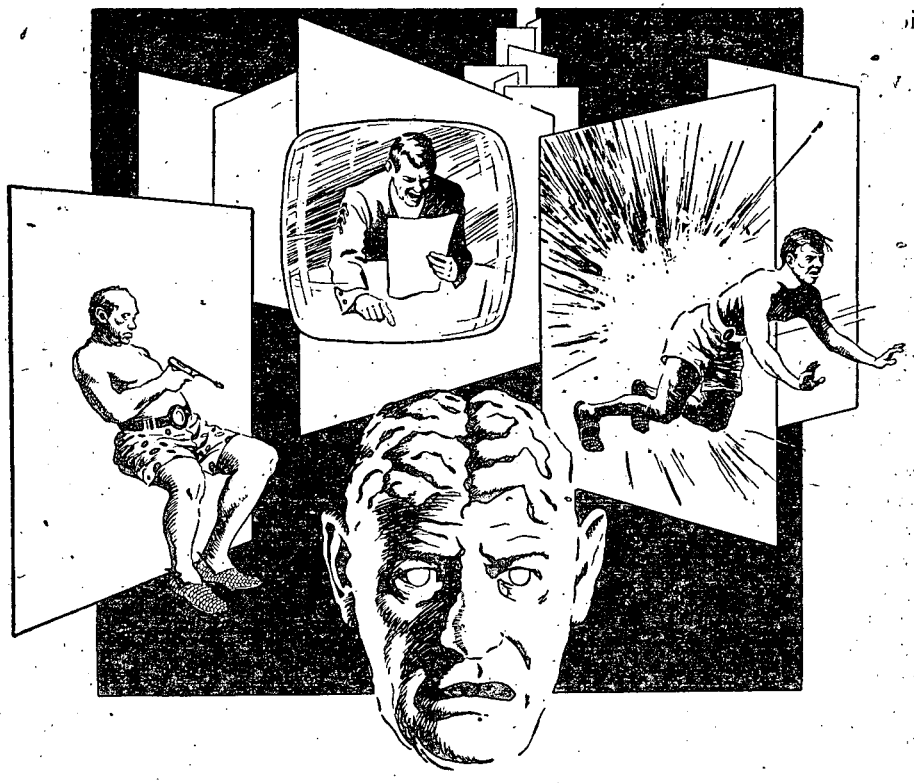

"Chances?"

"Considerably better. Our chances of successfully protecting you are forty-three percent."

I couldn't afford either one and told him so. He frowned. "We can offer you advisory service for a flat fee of fifty dollars, payable on your visor bill."

"I'll take it. What do you advise?"

He waited a moment until the visor had registered the contract.

"Disappear."

At more than fifteen bucks a syllable, advice was coming high nowadays.

I snapped the off-switch angrily and then thought better of it and dialed again. This time I switched the selector over to "color."

The girl on the screen smiled a warm greeting. "Oh, it's you, Bob. I—"

"Marcus Kennedy III has just declared open season on Germaines and I'm to be the prize trophy of the season," I interrupted. "The reason he gave was you." She didn't say what I expected her to

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so I said it myself.

"You could go back to him," I suggested. "After all, which would you like the most? To be married to a wealthy old man and live in luxury the rest of your life or have a little urn of my ashes on your mantelshelf?" The way I phrased it, it didn't even seem like a contest.

"Don't be silly, Bob, neither," she said, escaping the horns of the dilemma with a woman's logic.

"Fine," I said sarcastically. "What do you propose I do?"

"Disappear," she said calmly. "Hide out for thirty days. At the end of it, Kennedy can't touch you. In fact, he'd be obliged to protect you. If anything happened to you then, he'd be the first to be suspected. Once the legal thirty-day period is up, it'd be his neck if you were killed."

"To say nothing of mine. Thanks for the tip—though I'm not crazy about spending my vacation behind dark glasses and whiskers. Doesn't exactly sound heroic, either."

She made an annoyed sound. "Heroism and its emotional connotations went out in the twentieth century. Besides," she added, her eyes softening, "I'd much rather have you alive, Bob."

It was two minutes before I realized the set was off.

Jan's suggestion was a good one but where on Venus could I go? I didn't know many people—certainly nobody influential enough to intercede with Kennedy. The policy of VCO—like any other business on Venus—was strictly hands off. All Terra men are warned when they come to Venus to watch their step in local affairs.

I was still thinking about it and getting no place when the noon mail arrived. I heard it drop from the mail chute onto the kitchen table but I let it sit. I had more important things on my mind than the latest printer's proofs on pamphlets for the VCO. Besides, I was on vacation.

The "mail" exploded five minutes later.

I clawed my way out of the plaster and splintered furniture into a room filled with smoke—I could hear the crackle of flames in the kitchen. I wasn't bleeding much—mostly bruised and shaken up with a king-sized headache.

The crackling of the flames sounded louder and I opened the door leading to the hallway. A bleak expanse of fire steel stood just outside, effectively sealing off my apartment. Fire precaution, I remembered, to keep the fire from spreading. One of the strong points the apartment building offered when I rented there.

The smoke made me choke and I staggered to the fire escape on the outside. As soon as I opened the screen, the beam of a needle gun seared the plastic door frame beside my head.

I dropped to my knees and rolled against the wall. A portion of it gave to my touch and half a second later I was plummeting down the clothes chute. I landed in the base-

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ment of the building with a jar that knocked the wind out of me. Things to file and forget, I thought—a small pile of dirty shorts doesn't do much good in breaking a four-story slide.

Outside, a detachment of the Security patrol had arrived along with the usual crowd of curious onlookers, the eager spectators who would patiently wait for the Security boys to bring out my charred body. I came out of a side entrance and slowly worked my way through the mob, hoping nobody was noticing me.

It wouldn't take Kennedy long to figure out that I had escaped. I had, at the most, an hour's start before he organized a search that would probably prove to be fatally successful.

I don't know what brought Oliver Camden and his experimental farms to my mind—I suppose by logical elimination. Try to think of the most remote, the least populated, the least likely place on Venus where a guy would want to go and you automatically think of Camden's Extraterrestrial Biological Research Farms.

It had its points. Venus is a difficult planet on which to get "lost". The towns are few and the only link between is the tubeways, or in most cases, the swamp buses that paddle over the marshy surface. It would be simple for Kennedy to station a man at the tubeways and the bus station to watch for my departure. Or else, alert men in other towns to await my arrival. I still had half an hour's lead, though. If I left now and got off at some spot between towns, I stood a good chance of ditching Kennedy's bloodhounds.

To try and remain in the city itself under an assumed name and a disguise was impossible. The endless questioning and red tape of the Venusian bureaucracy made the first impractical—and to try and disguise yourself when all you wear is a pair of shorts was equally out of the question.

I had to leave town and get off at some halfway point. The only halfway point I knew of was Camden's Farms.

I paid the fare at the bus station and idly watched the people getting on. An old lady was the first after myself. Then a sailor from the Venusian Navy and his girl friend hopped aboard for a sight-seeing ride and a dark seat in the rear. A tourist from Terra got on next—you could tell he was from Terra by the fancy shorts and halter he wore. He waddled down the aisle, spotted me by one of the windows, and eased down next to me.

The swamp bus pulled out of the station, its huge wheels starting their monotonous sucking sound, and I turned on the seat visor to take my mind off the bleak scenery.

"Been on Venus long?"

"Two years."

"Practically a native, eh? Quite a country. Great for rheumatism and asthma. Where you going to now?"

"Two towns up," I lied.

Suddenly the seat visor lit up with what I knew was going to be a familiar face before the thirty days was

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over. It was the lard-white, slightly-bloated face of Marcus Kennedy III. I went to turn off the scope but my fat friend from Terra stopped me.

"Gotta hear this," he wheezed.

Kennedy started to speak. "Ladies and gentlemen, Kennedy Enterprises is starting a great new contest for our visor audiences. All you have to do is identify the person whose photograph we show to you on the screen and notify Kennedy Enterprises immediately. The photos may be of your town mayor or they may even be of the person sitting next to you as you watch this. To the first person who notifies us of the identity and whereabouts of the person in the photograph, we will award one thousand dollars in cash. Here is the first photo."

I had to admit it was a good likeness.

"Kennedy doesn't miss a trick, does he?" my fat friend said in a low voice, pressing a needle gun against my side. "That was just in case I didn't catch up with you. Now suppose you and I get off at the next stop and wait for Mr. Kennedy, eh?"

Fat boy must have trailed me from the fire—but since I was still alive, that meant he had orders to treat me kindly. I shoved against him so that the needle gun was clamped between his body and mine.

"If you pull the trigger now, your gun will backfire," I said quietly. "The gases can't escape from the muzzle." Fatty blinked hesitantly and I brought up my hand from the rear and caught him at the base of the neck. I let him slide a little, propped him up in the seat so it looked like he was sleeping, and fed him some stimo-capsules from the vending machine on board. When Kennedy caught up with Fatty, out cold and stinking of stimo, there'd be hell to pay.

I got off at the Farms—or what I thought was the Farms.

"You go down the road about a mile," the driver said. "Just be careful you stay on it. You'll have a tough time if you ever get off." The paddles started up again and a second later the bus had disappeared into the fog.

I started out sloshing through the mud, still thinking of my departure from the city. So far my plans had developed more flaws than a piece of cracked china—and one of the worst was the walk to the farms along the semisolid strip of mud laughingly called a road.

It was two hours later when I staggered up the wooden walk leading to the administration building for the Farms.

"Have a drink," Ollie offered. I took the glass, swallowed, and then had sense enough to start sipping it like it was nectar—it wasn't every day you get a good grade of Earth-import bourbon.

Ollie hadn't changed much in the two years since I had seen him last. A little more on the tubby side, a little whiter—he had been neglecting his sunlamp—and a lot balder. But

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still the same old, sharp-minded Ollie.

"What have you been doing lately?" he asked, settling himself in a chair.

"Working for VCO—sold my soul as a publicity man. How about you?" I asked innocently.

"Still testing and getting no place."

"Testing? Testing what?"

Ollie sighed. "I thought everybody knew why I came to this fungus-ridden fever spot. Research on the Squanchies, Bob."

"But—"

He held up a hand. "Tell you more after supper. I'll be better fortified to answer any and all stupid questions then."

The meal wasn't bad—he had an indentured cook who seemed to be fairly happy with his lot and was quite skillful in hot-weather cookery. Usually, it takes time to wean most new cooks away from the starches-and-fried-foods routine.

After the ice cream and menthol mints, Ollie opened up with what it was all about.

"How intelligent are you, Bob?" he asked, filling up my glass with bourbon.

"Bright enough to recognize good liquor when I taste it." I caught the look on his face. "Oh. You mean seriously? I had a fairly high GCT on my Terra Transfer examination—about an IQ of 140. Nothing exceptional. Why?"

"How intelligent is your dog?"

"Why, I don't know," I floundered. "Fairly bright for a hairless, I guess."

"What if you wanted to find out for sure?"

"Uh . . . I suppose I'd have to conduct tests, something like that. Oh, I get it! You're—"

". . . Trying to figure out how intelligent the Squanchies are."

I pushed my empty glass forward for a refill. "Just between you and me, who cares—outside of the realm of knowledge for the sake of knowledge?"

Camden chuckled. "In a way, it's funny. Two powerful groups are pouring money into the project for two entirely different reasons. One group, here on Venus, is interested in a large supply of cheap labor. But any labor, to be useful beyond the extent of a beast of burden, has to have a certain minimum intelligence. There's another group on Terra who were instrumental in getting the Extraterrestrial Protection bill passed a decade ago. You remember the bill? It calls for the protection of all extraterrestrial forms of life that can be described as intelligent, according to qualifications set forth in the bill itself. That's the picture—one group wants to know how intelligent the Squanchies are so they can exploit them; the other wants to know so they can protect them. Comic, in a way."

"I suppose it's harder than it looks, eh?"

"Have some bourbon—it improves that mind of yours. You're right. It's tough. You can't go up to the

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beasties, draw a picture of the solar system, point to yourself and say 'one-two, one-two, me intelligent, how about you?'"

"O.K.," I laughed. "So you foiled the fancies of the fictioneers. What do you do—give 'em a Stanford-Binet?"

"Very funny. There are several preliminary things we have to go through. First, you have to establish a means of communication—which is, incidentally, very difficult to do. Since we and the Squanchies are about on a par with you and your dog as far as communication goes, only tests in which the beastie goes through some sort of activity are eligible.

"Then you have to figure out what you mean by intelligence. The dictionary says 'the ability to reason'—which leaves a lot to be desired. And once you figure out what you mean by 'intelligence' you have to figure out a way to 'grade' that intelligence. And don't forget that all intelligence is comparative. Are we interested in how intelligent a Squanchy is compared to another Squanchy—or to a human being? And if you're going to compare them to Homo sap, there's a million more things that have to be taken into consideration.

"In the first place, you couldn't expect it to do things that it isn't physically capable of doing. A Squanchy could never brachiate like a great ape, no matter how vital it was that it do so. And we can't set up tests for them using the same standards as we do on Terra. There are measuring sticks we use on Terra that are darned reliable. Sex and the rule of self-preservation, for example. We can make the *assumption* that they apply to living things on Venus—but can we be sure? We're dealing with things that have no connection with Terra; they're not beings like us, neither are they of our environment."

"You must have learned something in two years," I said cautiously.

Camden shrugged. "More physical progress than anything else. We've built up the station, got a staff together, built warehouses, built the 'cube' for the Squanchies, found out what they eat and information like that. They're peculiar in their diet, by the way—fresh shrubs and muck-reeds doesn't suit them, it has to be rotten. Half of our first group wouldn't respond at all until we found that out."

"How are you going to figure out whether the Squanchies you test are bright—for Squanchies . . . or are they idiot members of the species?"

"Don't know for sure. Test what we think is a representative sample and hope for the best."

"I suppose there's a reward if you succeed and a bit of unpleasantness if you don't?"

"You're so right. The cheap labor group will run me off Venus—or at least make it unhealthy for me. The humane group would probably forget about being humane, accuse me of being in league with the first

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bunch, and try and do me in if I went back to Terra.

"One thing for certain—I'd never hold another job on either planet."

For a guy who loved his work like Camden did, the future looked none too inviting.

I went on a tour of the Farms with Camden the next morning. The first stop was the "cube"—a huge, glass-sided affair looking like a gigantic, plastic building block. A cleared space extended all around it and inside was a jumble of vegetation, muck, and water—it looked like the cube had been open on one side and just inverted over a typical section of Venus.

"It's closed at the bottom, too," Camden said, "so they can't burrow out. Makes a pretty good cage for the beasts. Easy to observe but it still keeps them, as nearly as possible, in the same environment that they're used to."

We walked along it and I began to appreciate the immensity of the cube; it was over two hundred yards on an edge. We went to an observer's platform and looked in. I didn't see much at first besides the towering trees, the unhealthy looking vegetation, and the stretches of muck and mud that cradled stagnant pools of water. Then I watched for movement and spotted a Squanchy. It wasn't too pleasant to look at. It stood about four and one half feet high—a slit-faced, toothless, green-scaled travesty of a human being. Small gills that opened in the neck dilated in synchronism with the thing's breathing.

"I've seen them before," I said, "only then I wasn't sober. It looks more vicious than bright, too savage to be intelligent. I should think they would be quite a menace."

"They were considered to be when humans first landed—any alien being would probably be considered a menace by the first landing parties. Since the first days of colonization, though, they've been hard to find. They avoid the cities and towns. Their hides were never worth much, which probably saved them from organized extermination. The dozen or so in the cube represent a lot of sweat and ingenuity on our part. If elusiveness was a symbol of intelligence, then here are the brains of the solar system."

We walked over to another vantage point.

"What have you done so far?" I asked, gazing curiously into the murky depths of the cube.

Camden frowned. "Oh, we've done some of the basic work. We've dissected a few, traced the pattern of their motor receptors and effectors, found out which part of their brains—we think it's their brains—control which part of their bodies. We've studied growth in the young of the species and established that development is from the general to the specific in matters of movement and feeling. That is, they learn to perform general movements and actions before they go on to specific things, like grasping, or throwing, or push-

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ing buttons—that sort of thing. We know as much about them that way as we do about any mud puppy back on Terra. But do they think? Are they reasoning creatures? I'm no nearer to knowing the answer to that than I was two years ago. If you're interested, I'll take you to the test lab. Martin is running off some tests today."

I nodded and we started over. The test lab was a big shedlike building located on the northern side of the cube.

"What's the general system you're using?" I asked. "I had some psych in secondary, but I've forgotten most of it by now."

"The system is fairly simple. The precise method by which a Squanchy thinks actually is not important to us, so long as the end result is the same. That is, given a problem, can they solve it? That's all there is to it. Of course, the problems we set up for them are more directly related to their environment."

Martin—one of the biologists at the station—met us at the door of the shed and motioned us in.

"How do the Squanchies do? Stupid, bright, or just plain dumb?" I asked.

"I don't know," Camden said sourly. "We haven't had a response that could be classed as either one."

At the other end of the building, Martin was fussing around a large cage that seemed subdivided into corridors. A Squanchy huddled in a cage that was much smaller. Apparently it was to be released into the larger cage when Martin was through with his adjustments.

"What do you mean, you can't classify them? That seems like admitting defeat at a rather low level. If you can't classify their responses, it seems to me that your two years here haven't paid off at all."

He looked at the Squanchy's cage thoughtfully. "On the surface, I suppose it looks as if you're right. Actually, as I suggested before, we've got a good deal of information. Don't forget that no information at all, biologically or otherwise, existed about the Squanchies before we came here. So far we've failed in what we directly set out to do. Sometimes I'm inclined to think that our difficulty is a very simple one that escapes us because of its simplicity. Other times, I'm just . . . well . . . confused. Regardless of everything else, a Squanchy is still an animal with a central nervous system that has to eat to exist and follows a standard pattern of reproduction. You'd expect that there'd be *some* similarity between it and animal species on Terra."

He grinned crookedly. "Only there isn't. You can set up a very simple test that a moronic white rat could run and they'll fail it completely—but still not fail it in a standard way. We had one where three different paths led from the Squanchy cage to another containing a choice bit of rotting muck-reed. One of the paths was easily accessible, the others were rigged so that it got a whiff of

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chlorine gas if it tried to use them. Squanchies react to chlorine, incidentally, as we would to a gigantic dose of hydrogen sulphide or ammonia. It took the right path the second time out; it never repeated after that, neither did it try the chlorine paths. 'It didn't do anything—it just sat."

He wiped his glasses and continued in a low voice. "Ten million dollars worth of research just sat on its haunches and got hungry. Practically any animal on Earth could have learned the maze and after the first three trials, they could have repeated it correctly every time. But a Squanchy? Uh-huh.

"You'd think," he continued, "that a Squanchy would have to have a certain minimum intelligence to exist in an environment like this. It must have to solve problems concerning its existence every day—unless it has the great granddaddy of all fairy godfathers watching over it."

He lowered a view-through glass sheet that enabled us to watch the test but hid us from the Squanchy, then pressed a button releasing the Squanchy into the maze. It blinked sleepily at first, scratched a part of its scaly arm, and then apparently caught scent of the muck-reed. It lumbered along the main corridor of the maze and turned right. A whiff of chlorine drove it back. Without hesitation, it turned left and gobbled the muck-reed. The second time through it seemed quite hesitant, came to the turning point, and after five minutes of due deliberation, turned left. The third time was even worse. It didn't seem to want to attempt it at all.

"Maybe he's had all the muck-reed he wants," I suggested.

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"They eat it by the bushel," Camden said, "and this particular specimen has been starved for three days to make sure he'd be interested."

Back in the cage, the Squanchy, after much deliberation and false starts, had again arrived at the turning point. Once there, its hesitancy vanished. It promptly turned left again. This time, it was met with the chlorine gas. The Squanchy backed away warily, then turned and ambled back to its own cage, seemingly devoid of any more interest in the affair.

Camden shook his head sadly. "See what I mean, Bob? There you see two years of research sitting on its haunches and searching for water fleas. Maybe you can dope it out—I can't." He started back to the shack and I followed.

I sprawled out on the couch and let the sweat run off me onto the floor. It was hot and muggy, one of those days when newsprint would be so damp it would fall apart in your hands. The obsolete air-fan Camden had turned on did nothing but warm up the air still more. For the hundredth time I forced myself to forget about the ski slopes at Rainier and concentrate on something else. More than one climate man will tell you there's been colonists on Venus who have gone insane because they let their dislike of the weather grow into a mania.

Camden slouched behind his desk and idly tapped the top of it with a pencil. He was thinking hard but no new ideas were developing—he had got to the point where you do nothing but go around in circles.

"All of your tests turn out like that?" I asked.

He snapped the pencil and tossed the pieces into the disposal chute.

"Just about. Same sort of reaction. Complete the test once, perhaps, and then stall on the rest of it. No rules in the book that cover that. Given a simple test, any living organism improves his performance of the test as the number of practice periods increase. Apparently our Squanchies are the exceptions. The more repetitions, the less response. Maybe they operate on the law of diminishing returns or something."

"No logical reasons why?"

"None that I know of."

It was hard to keep from surrendering to the idea that it was all Camden's worry and none of my own. I felt the sweat run down my back and balanced the clammy discomfort against the energy required to get off the couch and take a shower.

Camden guessed what I was thinking.

"Bob, it's none of your affair. Let's shower for dinner."

At the table, he seemed lost in thought. If I asked a question, he wouldn't answer; and if I repeated it, he'd look up and ask me what I had said.

"You know, Ollie," I said, "you and I have somewhat similar problems. You try to solve the riddle of the Squanchy's intelligence—or lack

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of it—and I deal with the stupidity of an animal that by all rights should turn in a lot better performance than he does."

Camden looked puzzled. "Which one's that?"

"Man," I said, feeling somewhat smug over my little simile.

"To illustrate," I continued, "did you ever stop to wonder how they get people to come to Venus in the first place?

"You know I work for the Venus Colonial Office—publicity work and that sort of thing. Find out a lot of interesting items, some good, some bad, depending on how you look at it. VCO twists them so they all sound good. You remember the ads in the papers back on Terra and the colorful posters around the Rocket Fields and take-off ports? Come to Venus, the Planet of the Tropics! The heat and humidity are good for everything from asthma to yaws. Or you consider that not much of the planet is explored and you bill it glamorously as the Planet of Mystery, which not only sounds intriguing but sexy. You gloss over the fact that any Colonial has the right to homicide by presenting it as Adventure at Every Step! You stress the fact that Every Settlement is a Model of Sanitation and Every City a Masterpiece of Cleanliness, forgetting to state that they better be or fungus and disease would decimate the planet in a week.

"Well, that's my job—take a king-sized Turkish bath and present it as a Paradise in the Rough!"

I took my fork and stabbed savagely at the piece of tropical butter on my plate.

"People are stupid, Ollie. If they were bright, they wouldn't fall for the stuff I put out. Venus is a foreign culture, Ollie. If people had any brains at all, they'd use them in observing the culture and looking over exactly what they were getting into. They'd find out about the weather and the customs before rushing in to spend two years trying to find a sure cure for prickly heat. Either that or get into an argument with some Colonial and find out—too late—that if he doesn't like you, he has a right to homicide."

Camden yawned. "Very interesting, Bob. I'll sleep on it."

"Have nightmares about your ignorant Squanchies, more than likely," I muttered.

It felt like an earthquake. I clutched the sheet frantically and jerked my eyes open. Camden was shaking me up and down by the shoulders. He stopped when he saw me open my eyes.

"You're a hard man to wake up! What ignorant idiots we've been, Bob! The answer's been in front of our eyes all the time and we never realized it!"

"O.K.," I grumbled, "the sun is shining and the birds are singing and I'm to be Queen of the May. What's the big idea of waking me up?"

"Tell you at the cube, come on!"

I hadn't seen anybody dance around on two legs so excitedly in a

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long time. He threw my shorts and halter at me and we ran out to the cube. The entranceways were open, the glassite doors standing wide. The silence was almost tangible; there were no sounds from any of the other buildings in the living quarters compound. The huts that housed the laborers seemed empty.

I yelled at the top of my lungs, partly to see if anybody was around and partly to break the tension.

There was no reply.

Camden and I headed for one of the glassite doors and ran inside. We slowed down then, both of us realizing the difficulty of searching forty thousand square yards of Venusian muckland right then.

"I suppose we ought to search the compound first," Camden said slowly.

There was the quiet *whoosh* of hydraulics behind us. We whirled—and faced a blank expanse of glassite wall, unmarred by any opening.

"Martin or one of the others playing a joke?" I suggested, knowing perfectly well that they wouldn't.

"Poor joke," Camden said grimly. We walked to the walls and looked out at the compound and surrounding muckland, made green by the glassite. Figures were moving in the distance and I pounded on the glassite, trying to hail them.

The figures came closer. I felt sick. The figures were Squanchies, slouching purposefully to the cube.

"How come?" I asked, pointing to the figures outside.

"Turnabout," Camden said quietly.

I watched them for a minute.

"They're not stupid, are they?"

"That's a masterpiece of understatement. No, they're not."

"When did you figure it out? Last night?"

"Yes. I told you I'd sleep on what you said. I didn't. I stayed awake and thought about it. It seemed to me that some place in that tirade of yours was an idea." He paused. "It's too bad that it didn't occur to me sooner.

"In your confessional last night you said that anybody with brains would use them in observing our 'culture' before jumping in. It occurred to me that that's what the Squanchies have been doing, maybe one of the reasons why they're so hard to find."

"How about the ones you did catch?"

He shrugged.

"Maybe some of them let themselves be caught—sacrificed themselves in the interests of Squanchy science. What better way of evaluating the intelligence of a race than to let them try and test *your* intelligence?"

"How about the test failures? How do you explain them—if they're so bright!"

Camden almost smiled. "It's relatively easy to make up intelligence tests for animals lower on the scale than us, but how would you go about making up ones for those that were

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higher! If a lower animal made up an intelligence test for us—by their lights—how do you think we would fare? Do you think you could figure out the factor of repetition, for example? That's one of the things that really stumped our beasties. Invariably they would perform a test correctly the first or second time but how about after that? Having performed it correctly—and knowing they performed it correctly—could they figure out the reason why we wanted them to do it again and again? If you were in their position, could you do it? You'd probably do what they did—sit on your haunches and wait for our next move."

"Why do they have us locked in now?" I asked, feeling that I already knew the answer.

"Turnabout, Bob. We're to be the subjects and they the experimenters. They found out all they could one way; now they're going to try it our way."

Late that afternoon we found out what had happened to the others. We saw it when we rounded a small hill in the cube, simply walking around for the exercise. It wasn't very pleasant. Both Ollie and I got sick. I couldn't help thinking of his phrase: *We know as much about them that way as we do about any mud puppy back on Terra.*

"You made a lot of mistakes when you were conducting tests, didn't you?" I asked.

Camden nodded. "I know—there's nothing to prevent them from making mistakes either. Maybe fatal ones."

"Nice thought," I said.

I wondered what they would do. It would probably be clever, and it wouldn't be—nice.

I sat and waited.

My head ached. "What happened?" I asked.

"You've been in the maze," Camden said.

"What maze? I thought the Squanchies were going to do something to us?"

"They did." He laughed dryly. "I have to go through this each time you come out of it. Tell me everything that happened to you from the first morning of your vacation."

I did.

"Looking back over your memory of events, do you notice anything peculiar about them?" he asked.

I thought for a while. "One small thing," I said. "I came out here to get away from Kennedy; but once I got here, apparently I never thought of him again. That seems odd."

"Anything else?"

"Well—for a guy like me, I seem to have led a pretty exciting life for a while."

"You never knew Kennedy," Camden said quietly. "It never happened. You woke up the first morning of your vacation, showered, had breakfast, and read a novel. Late that afternoon you came out to the Farms. Nothing happened on the

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way. From there on, your memories are real. But you never knew Kennedy. You never were trapped in a burning building, you never were held up on the swamp bus. Your memories from the moment you woke up to when you arrived here are false. It never happened."

My head was spinning. "What did they do?" I asked dully.

"The ten-hour period from the time you awoke the first morning of your vacation to when you got off the bus has been made into a mental maze. The Squanchies blanked out your memories for that length of time, put in a few 'key' memories of things that could happen, and let you fill in the gaps. The visor call from the Bureau was one of these; so was the explosive letter and the burning apartment, so was the fat man on the bus. You filled in the gaps in your memories so they'd be coherent. You figured out how to get out of the burning building on your own, you figured out how to dodge the fat man.

"It's a good intelligence test; they put you, mentally speaking, in a certain jam and you figure your way out of it, mentally speaking. Simple—they pose a problem and you solve it. They posed the problem of the burning apartment—you solved it by thinking of using the laundry chute as an exit. There's always a solution—provided you can think of it. The beauty of it is, it actually never happens. No apparatus, no physical preparation. It's all in your mind."

"I think I see," I said. "How would I fail to pass the test, though? If it's all in my mind, what would be the sign of failure?"

"What would be the mental state of a person who thought he had died—knew that he had died?"

"Oh." After a while I said: "What about you?"

"They haven't done anything to me," he said slowly. "I think I'm the control for you."

"How many times have I been through?" I asked.

"Four."

"I've been lucky. I wonder if it can keep up?"

Camden looked away. "You're pretty bright," he said.

But I knew what he meant.

I sat down on the ground and leaned back against the glassite wall. I felt tired.

Suddenly I stiffened. There was a plucking at my mind, an insistent urge to remember—to remember back to the first day of my vacation. Another trip through the maze was due. I knew how it would start—but how would it end this time?

It would start out like days usually do on Venus—terrible.

THE END

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THE MAYAN ELEPHANTS

BY L. SPRAGUE De CAMP

An article on the general question of how cultures got that way. Specifically, if an African native uses a bow and an Amerindian uses a bow, did one learn from the other—or could both be inventors?

A terrific battle has been raging on the fringes of anthropology for forty-odd years between most of the profession on one hand and a dauntless band of rebels or radicals on the other. The rebels call themselves Diffusionists or Dispersionists, and the quarrel is known as the Diffusionist Controversy. The profession, as a whole, says the Diffusionists have been utterly defeated, but like the Spartans at Thermopylai they fight on anyway. Whether you deem them advanced thinkers or mere pseudo-scientific cultists depends on the point of view.

"Diffusion" in this case means cultural diffusion; that is, the borrowing of culture traits by one people from another. For an example you have only to look in the paper or in a picture magazine at the assorted Asiatics and Africans in Western coats, pants, and neckties to realize how much Western costume has diffused to the rest of the world in the last century—even to people in climates where any clothes are an absurd and uncomfortable encumbrance.

Diffusionists, then, are people who believe that cultural diffusion is all-important in the development of cultures, and they bitterly oppose those who think that, when two peoples in different parts of the world exhibit a similar culture trait, such as a canoe-paddle or a funeral-custom or a sun-god myth, these peoples could have invented the trait separately.

Every time you try to consider any of the larger questions of human culture—the origins of civilization, the migrations of early peoples, the making of inventions by primitives—you run into the diffusionist

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question. Moreover the diffusionist assumptions and methods of argument are used by a host of people other than the Diffusionists proper. By diffusionist methods, for instance, it has been "proved" that all human civilization originated in Egypt, India, Ohio, Brazil, and Plato's Atlantis; that all the early civilizations —Egypt, Sumeria, Yucatán, and Peru—must have been derived from the inhabitants of a lost continent or from superior beings from Venus; that the Lost Ten Tribes of Israel are the modern Masai, Zulus, Malays, Japanese, American Indians, English, or Irish; and that the American Indians must be of Egyptian, Phoenician, Jewish, Welsh, East Indian, or Polynesian origin.

It would seem obvious that when you start with the same set of facts and apply the same logic and come out with nine-and-sixty different and contradictory results, something must be wrong with your method.

The background of the Diffusionist Controversy is as follows: When social anthropology was getting started about a century ago, the pioneer German anthropologist Adolf Bastian asserted that cultural similarities between different peoples were due to a "psychic unity" of the human race, which caused the human mind, when confronted with the same problem, always to come up with the same answer. This is, of course, pre-scientific psychology, which nobody takes very seriously nowadays.

Then the rise of Darwinism suggested to the early anthropologists that human societies evolved like animal species, from small and simple to large and complex. Separate groups, they thought, tended to evolve independently along parallel lines, and even under similar circumstances, to develop similar forms from different ancestry. Just as the tuna, the porpoise, and the mako shark, though of vastly different ancestry and internal construction, look much alike on the outside.

The evolutionary anthropologists, largely accepting Bastian's "psychic unity" theory, assumed that all human societies were going through similar stages of the same process. Therefore modern primitives were perfect examples of our own ancestors a few thousand years back, and if left alone would develop our own type of civilization in time. Now, there is something to these ideas, though they are not the whole truth by any means and though some nineteenth century anthropologists carried them to unwarranted extremes.

However, in the early years of this century, some students of anthropology, mostly amateurs, reacted in an extreme manner against the teachings of evolutionary anthropology. The English psychologist William H. R. Rivers, a leader of the group, after pioneering in physical psychology, got interested in anthropology and went on expeditions to Melanesia. There he found a technique of mummifying corpses like that used in ancient Egypt. On this basis Rivers, the anatomist Sir

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Grafton Elliot Smith, and William J. Perry of the University of Manchester developed the diffusionist or dispersionist theory that all civilization came from one—or at most a few—Old-World centers.

The members of this school should properly be called *extreme* Diffusionists, because all anthropologists, even such anthropological evolutionists as Tylor and Morgan—who derived the Amerinds from the Tamils of India—have admitted much diffusion. Nobody claims that all those who use matches or guns invented them independently, though extreme Diffusionists like to pretend that the "orthodox anthropologists" really believe such to be the case.

Elliot Smith, following Eduard Braun in Germany and Miss A. W. Buckland in England, traced all civilization back to Egypt. He affirmed on feeble grounds that the discovery of copper-smelting stimulated the Egyptians to develop writing, agriculture, and all the other elements of civilized culture. Smith and Perry called this early Egyptian culture "Heliolithic". They claimed that it included sun-worship, mummification, pyramids, the swastika symbol, metallurgy, irrigation, and the custom of putting papa to bed when a child is born. Before this revolution the Egyptians, like all other men, lived like apes.

The Helioliths were supposed to have wandered all over the world looking for gold and pearls, which had a religious significance, and to have incidentally founded all other civilizations, including the Mayan and the Inca. Diffusionists thought that you could identify such cultural influences because the distinctive Egyptiac traits were tied together in a "culture complex" that tended to be transmitted in a solid bundle or not at all.

Smith put the Heliolithic expansion in the Ninth Century B.C.; Perry, about 2,500 B.C. Their chronology was fantastic; Smith asserted that the cultural diffusion started out from Egypt after 1000 B.C. and arrived in India in pre-Aryan times, *before* 1000 B.C. We are even asked to believe that the Mexican pyramids erected during the early centuries of the Christian Era were copied from Cambodian pyramids built five hundred years *later!*

Their general treatment of facts is about as reliable as that. For instance Perry, wanting to prove that all North American cultures were degenerate copies of that of the Mayas—who got theirs from Egypt—said the Mayas had irrigation while the North American Indians did not

Fig. 1: One of the "Mayan Elephants". A Mayan glyph, as accurately drawn by Catherwood (left) and as imaginatively drawn by Waldeck, with elephant head (right).

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—when the reverse is true. And he described Middle American history as one of "uninterrupted culture degradation" when it is nothing of the kind, but the story of the successive rise and fall of various peoples: the rise and fall of the Mayan Old Empire, the rise and partial decline of the New Empire, the rise and fall of the Toltecs, and the rise of the Aztecs. Nobody can say what would have happened to the Middle Americans if Europeans had not arrived. Perhaps the Aztecs would have fallen while the Mayas achieved another renaissance, or perhaps both would have declined while another people like the Zapotecs took up the leadership of Middle American culture.

Moreover it is hard to see why the Diffusionists should pick the Egyptians as the source of Heliolithic culture, since of all the great nations of antiquity they were the most stubborn and self-satisfied stay-at-homes. Except for a few coasting voyages around the Red Sea and the temporary conquest of Syria under the Eighteenth and Nineteenth Dynasties, they seldom left their favored land, resigning exploration and colonization to Cretans and Phoenicians. It is equally ridiculous to say that everybody lived like apes before the arrival of the Heliolithics, when such well-developed cultures as those of Neolithic Europe and Iraq antedated the rise of Egyptian civilization.

What is more, the northern peoples of Asia and North America could hardly have derived such ingenious inventions as pants, felt, skis, snowshoes, and igloos from Egypt, since the ancient Egyptians neither made felt nor wore pants, nor did they have snow to ski on or make igloos of.

Now that Elliot Smith has been gathered unto his sun-worshiping ancestors, the cult is carried on by Mitchell and Raglan in England, and in America by Harold S. Gladwin, author of the recent "Men out of Asia." J. Leslie Mitchell has written, not only a scholarly history of the Mayas from the diffusionist point of view, but also a rather good science-fiction novel, "Three Go Back" (1932) in which he sets forth a number of ideas about primitive man.

In the story, the transatlantic airship *Magellan's Cloud* runs into a time-warp that puts it back in the Pleistocene, though nobody aboard realizes the fact until the ship runs into a mountain of Atlantis at night. (You will remember that at the time the author wrote, the future of transoceanic flight was widely believed to lie with the large rigid dirigible airship. As he explains in the dedication, Mitchell believes in neither Atlantis nor time-warps, but he does believe in his picture of primitive man.)

Anyway, there are only three survivors of the crash, a woman and two men. These wander about in their nightclothes, seeing a mammoth and other Pleistocene animals, and living on what little they can

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kill until they are found by a party of Cro-Magnon hunters. These improbable cave men are noble savages on the model made popular in the eighteenth century by Jean Jacques Rousseau: jolly children of nature without clothes, fears, inhibitions, superstitions, government, war, possessions, aggressiveness, or any other of the supposed vices of civilization. As the author makes clear, all these deplorable things first began to afflict mankind when the Egyptians invented them, along with civilization, and spread them over the earth by diffusion.

This idea about the original state of man goes back a long way, to the ancient myths of lost Edens and Golden Ages, though it did not take virulent form until Rousseau promulgated his Noble Savage concept—never having known any savages himself. He and his contemporaries Morelly and Babeuf preached the natural goodness of man, along with an extreme equalitarianism and a dogmatic environmentalism. These ideas passed into early Socialism, and thus are responsible in the long run for such modern phenomenon as the war by the Michurin-Lysenko cult on scientific genetics in Russia.

In the case of Mitchell's novel there is also a pacifist angle, for he is anxious to prove that man is "naturally" peaceful. He accepted the assumption, also widely held at the time, that all wars are caused by wicked munitions manufacturers, "merchants of death" who foment quarrels among the nations from base motives of gain. As one of his modern men in the story is a munitions-maker while the other is a militant pacifist who has just been expelled from Germany for advocating the immediate lynching of all munitions manufacturers, the party of survivors is less congenial than it might be.

At any rate, the munitions maker dies after repenting his wickedness, and the other two are forced by a subsidence of the continent to migrate south with the tribe until they are stopped by a range of mountains. They find a pass, but as the pacifist is leading the tribe through it they are attacked by Neanderthal men. The Neanderthalers are "awful"—dirty, ferocious, and cannibalistic, just like armaments manufacturers.

Now, the conflict between Cro-Magnon and Neanderthal is a well-worn theme of science fiction, and since the poor Neanderthalers are no longer here to defend themselves, modern writers tend to give them the short end of the stick. Actually, since they disappeared while the Cro-Magnons survived, it would seem that if anybody was aggressive and cannibalistic it was our own ancestors. Moreover, despite Mitchell's portrayal of the Cro-Magnons as happy materialists without supernatural beliefs, it is obvious from their famous art work that they at least had an elaborate system of sympathetic magic to assure success in hunting.

For the rest, suffice it to say that Mitchell's hero and heroine finally

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get back to their own century, all full of pacifistic beans.

To return to diffusionism in general: The Diffusionists all think inventiveness such a rare trait that no major invention has been made more than once; that most savages are that way because they have degenerated from Heliolithic standards; and that similar culture traits in any two parts of the world are *prima facie* evidence of diffusion.

Now, this matter of "degeneration" is pretty much one of the personal prejudices of the anthropologist. Diffusionists apply the term to any loss of a culture trait, like rice culture or large stone monuments. But the change may be an intelligent adaptation to new conditions, as when the Polynesians moved to islands unsuited to rice-growing, and took to fishing and raising taro and bananas instead. And while the great pyramids which the Egyptian kings built as their tombs were from one point of view an engineering triumph, from another they represent a vast waste of effort, and the Egyptians were much better off when they dropped the custom.

Gladwin, the leading American Diffusionist, has an interesting variant of the diffusionist theory of New-World culture. After he has described a number of migrations from Asia by alleged Australoids, Negroids, and other peoples—mostly guesswork on his part—he suggests that when Alexander the Great died, the fleet he was building to explore the Indian Ocean sailed away, manned by Egyptians, Phoenicians, Cypriots, Greeks, and others whom he had hired as sailors. They went east to India and Indonesia, picking up recruits and women on the way, finally becoming the Polynesians, and pushing on to South America where they became the Arawaks. Their White leaders Viracocha, Quetzalcoatl, and the rest traveled about founding all the American civilizations; hence the "fair god" culture-hero myths of the New World. The native Amerinds, says Gladwin, are mere putterers who would never have got anywhere without such leadership.

To express his disesteem for those who will not accept this fantasy, Gladwin erects a straw-man whom he calls Dr. Phuddy Duddy, representing the "Voices of Authority", whom he then demolishes with the vim of a Mayan *nacom* tearing out his sacrificial victims' hearts. Unfortunately Dr. Duddy's stuffing seems a bit moldy. Gladwin attributes to Duddy a lot of convictions that few or no modern Americanists hold, as that the Amerinds came over in one migration, that they are of uniform physical type, that they are smarter than Old-World peoples, and so on. Also he has avoided facts like the recently found Tepexpan skull that don't fit his scheme. That is called selection of evidence, and is how the Atlantists and Lost-Ten-Tribes hunters get away with it among the imperfectly educated.

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As you can see, the uninventiveness of man is a cardinal dogma of the Diffusionists. Invention by preliterates is at best a controversial subject. Modern science, we know, is built upon (1) philosophical speculations about the universe and (2) technological invention and experiment. These are so closely associated today that, while the garret genius still flourishes, more and more inventions are made by scientists and engineers in the laboratories of universities and corporations.

However, it was not always so. The farther back one goes the more distinct science and invention become, until in ancient time science was a matter for priests and philosophers, while anonymous common men made inventions. Archimedes, a great Classical scientist, apologized for his inventions as beneath a philosopher's dignity, while on the other hand we do not even know the names of the inventors of such important devices, all less than fifteen hundred years old, as the rudder, the windmill, the horse collar, and the iron-casting furnace.

Although invention seems to have been a continuous process ever since the first sub-man learned to chip flint and feed fire, don't take seriously those stories of primitive life wherein a hero named Ug invents the bow, the canoe, the domestication of animals, and monogamy all in one lifetime. In real primitive life such developments are strung out over thousands of years.

Now, when two peoples far apart use a similar gadget or custom, did they invent it independently, or did they get it from a common source? Raglan and Smith assume that the latter is *always* the case, and by this convenient assumption the ultra-Diffusionists trace all civilization to a single source, usually located in Egypt. On the other hand the late Professor G. N. Lewis derived all civilization from Brazil, while others have sought it in Peru, the Ohio Valley, India, the Arctic, Atlantis, and Lemuria. (The "orthodox" or "anti-Diffusionist" view, which I think is supported by the weight of the evidence, is that civilization arose more or less independently in at least four places: Iraq, China, Mexico-Guatemala, and Peru, in that order.)

But *is* invention so rare?

The United States Government has for years been issuing over fifty thousand patents a year, or about one patent per year per twenty-five thousand citizens. That is not to say that you'll get one invention a year from any group of twenty-five thousand people, because there are other factors to consider: unpatented inventions, patents on very minor improvements, the contrast between the encouragement our civilization gives inventors and primitive conservatism, and so on. Still, any considerable primitive group should produce *some* inventions from time to time.

The ultra-Diffusionists, in fact, show a strange and snobbish prejudice against the concept that inventiveness is a widespread human

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attribute that crops up among working folk and primitives as well as among scholars and scientists. Raglan, for instance, insists that preliterates can't invent because they have no scholars and scientists among them, though as we have seen scholars and scientists are not necessary for invention. Therefore, say the Diffusionists, everything must have come from somewhere else—it matters little where. Laymen who read a little anthropology tend to agree with them, perhaps because, never having made an invention themselves, they find it hard to imagine anybody else doing so.

As Lord Raglan tartly puts it: "We are often told that the Bonga-bonga have discovered the art of smelting iron, or that the Wagga-wagga have invented an ingenious fish trap, but nobody claims to have seen them doing it." Howsoever, neither has anybody seen a Heliolithic Egyptian teaching them how to smelt iron or trap fish.

Of course, if it be true that there is no *a priori* reason to assume that a culture trait was either borrowed or invented locally, we may be left in the uncomfortable fix of perhaps never being able to learn how many culture traits originated. While we all like simple formulas to settle such troublesome cases, such assumptions are, after all, mere guessing. In the cases where we do know the origin of a trait, it turns out that both invention and diffusion have played large parts in the growth of culture.

For instance, printing was invented independently in China and Germany. The crossbow was invented in Classical times by Zopyros of Tarentum; re-invented or revived in medieval Europe; and independently invented in southeast Asia. The fire piston, a handy little gadget for lighting tinder by compressing air in a small cylinder, was independently invented in southeastern Asia or Indonesia and—in 1802—in France.

Where documentary evidence is lacking, we can make a good guess at the origin of a trait from its distribution. If the trait is found in one continuous area, the chances are that it was diffused from one center. If on the other hand it occurs in two widely separated areas, with no traces of its existence in between, it is likely to have been independently invented.

For instance, the blowgun is found—without mouthpiece—in southeast Asia and Indonesia, and again—with mouthpiece—in the tropical parts of the Americas. To take the blowgun from one of these areas to the other, one would have to transport it either across the vastness of the Pacific or over the great windy plains and through the hardwood forests of northern Asia and North America. Such a trek would take primitives many generations, during which time the travelers would be passing through land lacking either canes and bamboos for making blowguns or poisonous plants for envenoming the darts, and where the weapon itself would be almost useless.

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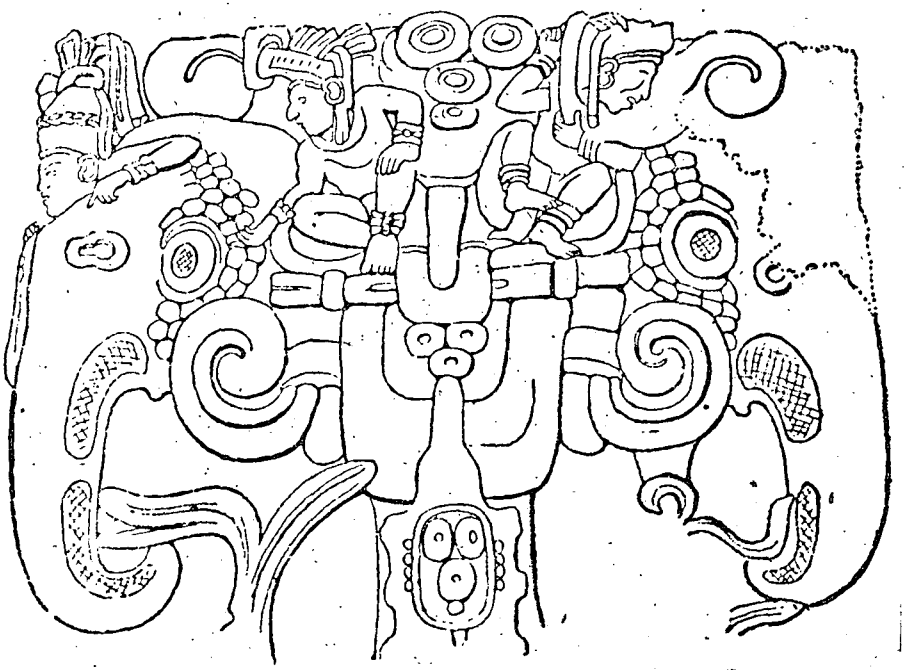

Fig. 2: More "Mayan Elephants". The top of Stela B at Copán, as drawn by Sir Alfred P. Maudslay.

The blowgun makes a particularly neat case because the Malayan peoples not only invented it independently, but also in Borneo and Celebes provided it with a gunsight and a bayonet, developed independently of the artisans who added these accessories to guns in Europe in the seventeenth century.

True, primitives do not invent very often—or perhaps I should say that their inventions are not often adopted. In a conservative tribal environment it may be less of a problem to make an invention than to get it accepted by your fellow-tribesmen without being liquidated as a dangerous innovator. The same invention may have been made many times before it finally took.

However, even in the short time that primitives have been under anthropological observation they have made some inventions. The ghost-dance religion, launched by the Paiute Indian Wovoka in 1889, was an invention of sorts. About 1900 a Gilbert Islander living in the Marquesas invented a detachable outrigger to keep people from stealing his canoe. And in the last century and a half a number of primitives like Se-

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quoya the Cherokee and King Njoya of Bamun, Kamerun have worked out systems of writing for their own languages—systems often utterly different from the European alphabets they might have seen or heard of.

In short, there is nothing incredible about independent invention, even among primitives. In civilized society it happens all the time: every year the United States Patent Office conducts hundreds of "interferences", investigations to discover who, of two applicants for a patent on the same invention, was the first inventor. And many scientific hypotheses have been developed independently by different men, the most celebrated instance being evolution, discovered at the same time by Darwin and Wallace.

Furthermore, even where we can trace the diffusion of a culture trait far and wide from one center, such traits have spread from many different places: tobacco-smoking from North America, rice culture from southeastern Asia, the stirrup from central Asia, the gun from Europe, and so on. Therefore there is no good reason to credit the Egyptians or any other single people with all the inventions of early civilization.

Some apparent similarities between culture traits of far-separated peoples may be due neither to diffusion, great inventive genius, nor "psychic unity", but to the limitations of the material. If you set out to make a paddle, you soon learn that your paddle must be of a certain length and shape—within rather narrow limits—or it won't work. Likewise in the burial customs beloved of Diffusionists, you can do only so many things with a corpse: bury it as among us, burn it like the Hindus, mount it as in Inca Peru, throw it away as in Tibet, or eat it like the ancient Irish. If you decide to keep it, you will have to preserve it against decay by stuffing, drying, or other forms of taxidermy. Since most of these few alternatives were worked out long ago, the funereal customs of different tribes are bound to look alike now and then by pure chance.

Ultra-Diffusionists, moreover, fail to distinguish between the handing on of material objects and that of techniques. Material things obviously travel much farther and faster; guns diffused all over the world within a few centuries of their invention, according to tradition by Friar Berthold the Black in 1313. But only in a few places did non-Europeans learn to make guns for themselves. A pot can change hands in a matter of seconds, while the art of pottery requires training that a wandering trader could probably not give even if he wished.

Further, if people who know how to make a given artifact think about the matter at all, they are probably unwilling to give away their knowledge to outsiders for fear of losing the commercial or military advantages that exclusive possession gives them. Thus the Chinese kept the nature of silk secret from the West for centuries until silk-worm eggs were

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smuggled out in the reign of Justinian.

Therefore to argue diffusion from likeness of techniques all by itself, in the absence of material objects, is backwards reasoning. A few Egyptian scarabs or Greek coins, found in undisturbed American sites, would make a much stronger case for Old-World trade with the New in ancient times than Mr. Gladwin's comparisons of culture traits; but no such staggering discoveries have been made except in the books of writers like Churchward, the Mu man.

Moreover the Diffusionists are probably wrong in thinking that any collection of culture traits called a "complex" will stick together indefinitely and can be traced all over the world. There are two kinds of culture-complexes: the logical or organic, where one trait necessarily entails the others—as the domestication of the horse implied the saddle, bridle, and whip—and the accidental or adventitious. Groups of traits of the former kind stick together, certainly, so that when the Plains Indian adopted the horse they took over the saddle, bridle, and whip along with it. Contrariwise, groups of the latter kind show only a slight tendency to stick together. Thus tobacco-smoking went all over the world shortly after the discovery of the Americas, without—fortunately—taking with it such other Amerind traits as scalping and shamanism.

Finally, the whole diffusionist controversy is somewhat unreal, since, as Malinowski once stated: "Diffusion is but a modified invention, exactly as every invention is a partial borrowing." In other words, nearly all inventions are improvements on something invented previously, and people who borrow culture traits usually modify them in the process. Where you draw the line between borrowing and invention is, therefore, a matter of personal preference.

The ultra-Diffusionists have been especially eager to derive the New-World cultures from the Old World, arguing that civilized Amerinds must have been connected with Egypt because they built pyramids and left mummies behind them; with China because they used jade; with India because they sculped elephants upon their monuments. All these arguments dissolve at the touch: While the Egyptian pyramids evolved from tombs, those of the Mayas and Aztecs evolved from temple platforms and moreover were built thousands of years later; the Peruvian "mummies" are mere dried-up stiffs preserved, not by Egyptian embalming technique, but by the dryness of the Peruvian climate; the Mayan jade is of New-World origin; and so on.

The myth of the Mayan elephants was started by John Ranking's "Historical Researches on the Conquest of Peru, Mexico, Bogota, Natchez and Talomeco in the Thirteenth Century by the Mongols, Accompanied with Elephants" (1823). Ranking's "elephants" were the fossil remains

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of mammoths and mastodons, found in great numbers in the Americas. Some of these beasts were probably alive when the first men arrived in the New World, but became extinct long before the rise of the Mayan civilization.

This fiction was further built up by one of the most amazing characters in the history of archeology—Jean Frédéric, Count de Waldeck (1766-1875) soldier, artist, explorer, courtier, revolutionist, and archeologist.

Waldeck commenced his adventures at the age of nineteen when he went with Le Vaillant's expedition into the unknown interior of Africa. Subsequently he became an adventurer in the French Revolution, and later a soldier and a naval officer under Napoleon. Then he took an active part in Spanish and Latin-American revolutions. In 1821 his imagination was fired by the sight of Mayan ruins in Guatemala, and on his return to London he illustrated the first modern book on the Mayas.

This book came to the attention of Lord Kingsborough, the last prominent advocate of the theory that the American Indians were the descendants of the Lost Ten Tribes of Israel. (This hypothesis had been first advanced by Diego de Landa, that Spanish bishop who burned all the Mayan native literature he could find on the ground that it was full of "lies of the devil".) Kingsborough sent Waldeck back to Central America with a job as a mining engineer and a commission to draw American antiquities and seek traces of the Lost Ten Tribes. Although Waldeck, in his sixties, had already had enough adventures for three men, he was not slowed up yet.

During the next decade Waldeck scrambled over jungle-matted ruins, drawing them as he thought they should have looked. His beautiful drawings, alas, were so full of inaccuracy, exaggeration, and prettification as to be scientifically worthless. Not satisfied with inserting his young Mexican mistress *sans* clothes into many of the pictures, he put things in them that were never there at all, such as four statues of men in Phoenician-style headdress holding up the front of the Temple of the Magicians at Uxmal.*

Nevertheless Waldeck's first book, *"Voyage pittoresque et archéologique dans la province de Yucatan"* (1838) won him a medal and a pension from the French government, and stimulated John Lloyd Stephens and Frederick Catherwood to undertake their famous joint expeditions to Yucatán, which really put the science of Mayology on its feet. Waldeck went on to marry, at eighty-four, a seventeen-year-old girl by whom he had a son, to publish his second book at one hundred, and finally to drop dead at one hundred and nine just after turning to look at a pretty girl on the boulevards of Paris.

Among Waldeck's scientific felonies was to draw a number of pictures of Mayan glyphs with nonexistent elephant-heads in them. Fig-

*Pronounced oosh-mahl.

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drawn by Waldeck, and the exact same glyph as accurately drawn a few years later by Catherwood. When Elliot Smith learned of these drawings by Waldeck almost a century later, he insisted upon taking them seriously—though Catherwood's fine work had long been available—and publishing them as evidence of his Heliolithic theory!

Meanwhile Lord Kingsborough ure 1 shows one of these glyphs as had published his "Antiquities of Mexico"—nine enormous volumes full of reproductions of Aztec picture-writings and art-works, with voluminous notes arguing his Jewish-Indian theory. (You can find it in most big libraries.) Kingsborough not only sank his entire fortune in this project, but ran up such large bills that he was thrown in Dublin's debtor's prison, where he died.

Finally, Diffusionists pointed to the monolith called Stella B at Copán, on which are carved four creatures that look somewhat like elephants with mahouts on their backs. However, if one examines the monument closely—see Figure 2—one sees that the "elephants" have nostrils, not at the ends of their "trunks" as elephants should, but in front, at the roots of these organs. Furthermore they have large round eyes surrounded by feathers. Feathered elephants, as you know, are extremely rare; these are probably conventionalized macaws.

Actually, the resemblances between the cultures of the Mayas and other Amerind peoples and those of the Old World are no less significant than their differences. At the time they were discovered, for instance, the New-World peoples lacked the plow, the wheel, Old-World domestic animals other than the dog, Old-World food-plants, and Old-World epidemic diseases. The famous Mayan calendar is drastically different from Old-World calendars, being based upon a year of eighteen twenty-day "months". The Mayas invented a zero-symbol several centuries *before* the East Indians devised one in the Old World. These facts clearly imply that when the Amerinds reached the New World from eastern Siberia they were unburdened by plows, seeds, smallpox, calendars, et cetera; were in fact primitive hunters.

In the case of the Mayas we can be reasonably sure they invented many of their culture-traits like their calendar, writing, paper, and architecture; others they got by diffusion: metallurgy probably from South America and the bow from Asia via Alaska. On the subject of pottery there is evidence both for independent invention and for diffusion. Lastly, despite talk of Amerinds' being mere "putterers", they created several ingenious devices like the tobacco pipe and the hammock that were quite unknown in the Old World before Columbus.

So the next time somebody tells you that the Hopis *must* have come from Australia because they used

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the boomerang, or that both the Hopis and the Australians *must* have got this weapon from ancient Egypt, don't take him too seriously.

And the Amerinds were neither putterers nor supermen, but ordinary human beings who did pretty well considering what they had to work with; who neither came to America completely uncultured, nor invented all their culture traits themselves, but who still showed normal human ingenuity without help from Atlantean enlighteners, Egyptian gold-prospectors, Macedonian sea-captains, or other Old-World sources. And to use a nonscientific argument, haven't we stolen enough from the Amerinds without depriving them of their just claim to the same degree of originality that other peoples have shown?

THE END

THE ANALYTICAL LABORATORY

"To The Stars" took top place in the March issue; judging from the character of the letters, it deserved it. And the sequence of the stories seems to follow neatly, and exactly, the degree of thought required to appreciate the tale. The plot of "To The Stars" called forth a number of technical letters, and evidently stirred a lot of thinking. The plot background of "New Foundations" was, similarly based on human problems and thoughtful analysis of situations. And similarly down the line.

It appears fairly evident that, unlike the readers of more general magazines, science-fictioneers have the unusual characteristic of finding thought not hard work, but good fun—an interesting relaxation.

Gentlemen, I hope that form of interest continues; that's the basis on which I'm trying to pick stories!

But in tabular form, here's what you thought of the stories in the March issue:

Place	Story	Author	Points
1.	To The Stars (Conclusion)	L. Ron Hubbard	1.85
2.	New Foundations	Wilmar Shiras	2.30
3.	The Mercenaries	H. Beam Piper	3.21
4.	Regulations Provide	Raymond F. Jones	3.68
5.	Conformity Expected	H. B. Fyfe	3.91

Every postcard, letter, or note commenting on the stories is counted in on the votes; I'd appreciate more letters, and more postcards, for that's the only way I can tell what you—the real and final editors of this magazine—like.

THE EDITOR.

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BOOK REVIEWS

"Giant Brains," or Machines That Think, by Edmund C. Berkeley. 255 pp. New York: John Wiley & Sons. $4.00.

Here is a factual book that should be right up the alley of Astounding readers. As science fiction fans, we have been intrigued by tales of marvelous thinking machines. Of course, details were lacking and rightly so, since science fiction anticipates the future. Nevertheless, many of us had an abiding curiosity of how these marvels could be actually realized. Here now is the chance to satisfy that longing.

Basically, this book does two things and, it should be said at once, does them very well. First, it gives a *connected* account of the accomplishments to date in the field of large-scale automatic calculators and their offshoot, the logical machine. Second, it extrapolates the possibilities inherent in such machines. This it does not only from the technical side but also from the side of the social implications. The connectivity is achieved successfully because the author takes pains from the outset to supply the reader with the necessary background information. Thus, in Chapter I, he discusses some aspects of the nature of thought in a human and the parallelisms in the machines. In Chapter 2, he tells about the nature of information, how it is measured and the physical devices for handling it.

Having supplied the basic framework, the author shows step by easily followed step how to build a machine to process information, i. e. to think. This is "Simple Simon," a machine that knows only the numbers 0, 1, 2, 3. This machine is well worth understanding since it incorporates the basic principles by which any large-scale computer works. We are shown Simon's flesh and nerves, its range of mentality, the structure of its memory and how information is processed within it.

Having this stripped down to fundamentals, the author next describes the functioning of existing machines. These include punch-card calculators, the M.I.T. differential analyzer, Harvard's I.B.M. twenty-three digit machine, Eniac, the first all electronic calculator, and the Bell Laboratories relay calculator, the machine that has never given wrong results.

A most interesting chapter is devoted to the Kalin-Burkhart logical

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truth calculator. This is a machine that reasons logically; it does not handle numbers. Again the author builds up the background before giving details. He shows how logical truth can be calculated by Boolean algebra and how the machine handles this algebra. A problem involving logical elements is then set up and solved. It is then shown how such a machine could be used to examine contracts for loopholes. As a matter of fact, the machine has been given extensive tests by an insurance company. Its applicability there should be apparent to any one who has ever tried to understand the fine print in an insurance contract.

The book devotes a considerable amount of space to possible lines of future developments. A few of the possibilities discussed are: an automatic typist and stenographer, a recognizer, a psychological trainer, et cetera. There is even a reasonably detailed analysis of how such machines could be constructed. There is also a chapter on the possible repercussions such machines may have on organized society and how society could go about controlling them.

The book also has supplements which contain interesting material on semantics and applicable mathematics, such as nondecimal number systems and logical algebra. There is also a valuable bibliography which included several references to stories and articles that have appeared in Astounding.

Now as to two minor criticisms. This reviewer objects to calling existing machines "giant brains." They are not there, yet. The other is the implication that the Kalin-Burkhart machine was the first machine to calculate logical truth. As a matter of fact, Jevons, the English logician, built one in 1870! It seems to have done everything that the Kalin-Burkhart machine does but, of course, not electronically. But these are very minor points indeed, raised only to show the reviser's independence of thought and his erudition. Joking aside, Mr. Berkeley should be congratulated on the excellence of his treatment of a subject that will be of ever increasing importance to science and society. It is a very readable book. By all means, read it.

E. L. Locke

"The Thirty-first of February" — 13 Flights of Fantasy—by Nelson Bond; Gnome Press. $3.00.

This book will make a fortune for the first person who copies all the eminently quotable quotes out of it and submits them to the various Digests that pay cash for patteresque speech. When Nelson Bond decides to play football with the English language, it is strictly Pun Formation. At playing on words he is the rich man's Shakespeare.

His plots aren't bad either.

"The Thirty-first Of February" might be described as a baker's dozen of literary éclairs, each more de-

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licious than the other. Or is that impossible? Well, the "Thirty-first" is an impossible book—impossible in the sense that it may not be possible for Bond to top himself in another collection. And to read this one is to want another. Well, Bonds have a habit of increasing in value with age.

But I am writing all around the collection. I should like to quote some of its knocked out sequences, but there is a solemn injunction on the copyright page to cease and desist from so much as reprinting a comma from the contents. The blurb on the jacket is the most disfrustigating—disgustingly frustrating—that I, as a book reviewer, have ever encountered; for the thing constitutes a perfect review of the book! It tells the truth about how good the selection is, in just the manner I should have elected to write this review! I am being forced to the conclusaion that no one but the author could comment on the book with the cleverness it deserves.

There's a temponautical tale; a story of justice with horror—rather than mercy—a yarn you may remember from the old *Unknown,* "Take My Drum to England"; a puns-drunk ghostory called "The Gripes of Wraith" (!); and, among others too humorous to mention, "The Enchanted Pencil". This latter is the clue to the whole collection: It is the story of the author who acquires the Midas pencil. Everything he writes with it turns to gold. We Midas well face it; Nelson Bond obviously owns such a pencil. Or puncil. "The Thirty-first" is first-class funtasy, leavened with a soupçon of sobriety.

Forrest J Ackerman

"Nomad," by George O. Smith. Prime Press, Philadelphia. 286 p. $3.00.

This is the story of Guy Maynard of the Terran Space Patrol who was kidnaped, without any warning or preliminaries of any kind, by an armed Martian. That the kidnaping took place right in Sahara Base was not only especially unlikely, but also especially disconcerting to an office of the Space Patrol. But Guy Maynard found out that it was not the first action of an attack, but a very special and very personal affair: he was expected to reveal—under torture, if necessary—information about a new supership of the Patrol.

But the Martians had overreached themselves, kidnaping an officer out of Main Base just could not be done without immediate detection and chase. In the engagement the Martians are handicapped by the fact that they evolved on a smaller planet and that they can't stand as much acceleration as Earthmen. Their crippled ship departs at full acceleration; the Earthmen who gave chase turn around and go home. They knew that all Martians aboard must be dead, and they think that Guy Maynard might have been dead even before the engagement started.

And then a strange chain of events develops. The derelict is boarded by

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a member of a race—completely human in appearance and even in outlook—of which nobody had any knowledge. Many years ago that race was threatened with extinction, finding that its sun had a tendency to turn nova. Fortunately for them they had the necessary knowledge to free their planet, Ertene, from the gravitational bonds of its sun and to go adrift into space, a nomad planet, kept alive and thriving by the "light shield" which permits any radiation to enter but none to leave. Thomakein, the Ertinian, finds that Guy Maynard, the Terran, is still alive, if in grave condition. And he tows the whole derelict to his home planet. When Guy Maynard awakens he is on Ertene.

There the real story begins. Shall he just stay on Ertene? Or shall he try to talk the Ertinians into joining their planet to the planetary family of our own sun. From the human point of view the latter would be intensely desirable, the Ertinians have a science all their own from which Earthmen can learn a great deal—also vice versa to some extent—and since the Ertinians are virtually humans, they are likely to be allies of Earth in case the Martian war should flame up again. But the Ertinians also see that all the obvious advantages are with the Earthmen. They seem inclined to continue their nomadic existence which enriches their own knowledge every time they pass a planetary system.

But most of the readers of Astounding SCIENCE FICTION know the story, I have told the beginning of the plot only for the sake of new readers and to recall to the mind of the older ones which story it is. These older readers will remember that an Ertinian has masqueraded as a wealthy Earthman in the meantime. That he is indulging in some private plotting of his own. That Guy Maynard is returned to Earth where he rises in rank with great speed, due mostly to a number of inventions of Ertinian origin for which he receives the credit. That he finally "discovers" the planet Mephisto, outside the orbit of Pluto. That there is a war with the inhabitants of that planet because they resent any contact. That Guy Maynard is then exiled from Earth, because he refuses to tell Ertene's position, that he is rejected by Ertene.

Both his exile from Terra and his rejection from Ertene are caused by the Ertinian Thomakein who had found Maynard originally. Readers of Astounding SCIENCE FICTION may remember that there was some confusion in the original version—that has been straightened out, but to my personal taste there is still too much plot and counterplot, sub-plot and sub-sub-plot.

For quite obvious reasons the technology in "Nomad" is less detailed than the technology which characterized the Venus Equilateral series. It is a story of a different kind and it is also a story which keeps moving from page one to the end.

Willy Ley

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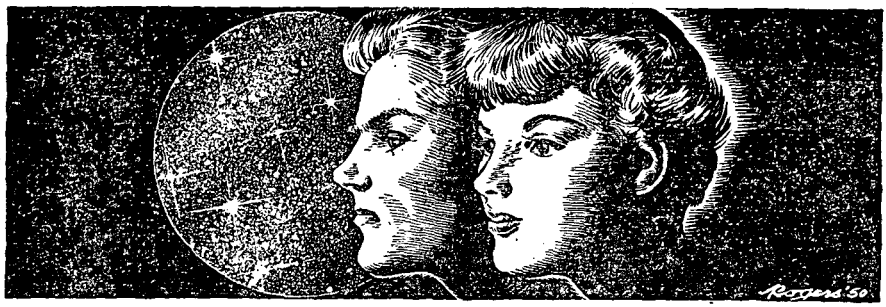

THE WIZARD OF LINN

BY A. E. VAN VOGT

***Once,** thousands of years before, two mighty empires fought. Now, Clane of Linn, with a captured ship, a barbarian army, and a civilization returned to peasantry had to stop the resurgence of the alien Empire.*

Illustrated by Rogers

Lord Clane Linn, the "child of the gods," had made progress. Born a despised mutation into the ruling family of the half-barbarous, decadent Linnan empire about 12,000 A.D., he had grown up almost unnoticed by those in the family and government who schemed endlessly for power. Contemptuously relegated to the temples for training, he learned something of the inner nature of matter from a few wise men who had guessed the secret behind the atom gods. By the time his potential enemies realized that he might be dangerous to their plans he was too powerful to be destroyed.

He explored the gigantic pits—where the atom gods were believed to dwell—and found remnants of many destroyed cities. From these husks of what had once been megalopolitan centers, he gathered odds and ends of machinery and weapons, including a sphere of energy that absorbed or disintegrated all energy and matter it touched.

The sphere reacted to the thought of the person who knew the cues to which it responded.

His discoveries explained many things. They explained the half-mythical stories about a long-dead, wonderful civilization that had ap-

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parently existed some thousands of years before. They gave a clearer picture of how a bow and arrow culture could exist side by side with simple-type spaceships that any skilled metal worker could build. But the mystery of the forgotten disaster remained unexplained.

With the help of the sphere of energy, Clane defeated the invasion of Czinczar and his barbarian army from Europa, one of the moons of Jupiter. The captured Czinczar, a remarkable man, convinced him that the vague stories of an alien being called the Riss—ancient books referred to such a creature—were true. The barbarian leader showed the mutation the dead body of a large nonhuman creature. To him, its presence indicated that the Riss were back in the solar system.

Within a few months his prophecy was borne out. A gigantic Riss battleship arrived on Earth. The invader destroyed all human beings who came near it, and rejected attempts at communication. Two Riss patrol craft were captured, however, and in one of these, Clane and his sphere of energy successfully boarded the invader. The Riss patrol ship automatically enters its mother ship during the height of a Linnan naval attack. Half the Linnan fleet is destroyed in this assault, and Clane discovers afterwards that every Linnan crewman has been destroyed by an irresistible antiorganic resonator aboard the battleship.

Clane and his small group are protected from this fate by a device aboard the captured Riss liftboat. Once aboard the main Riss vessel, Clane uses the sphere to kill the Riss and capture their ship.

Meanwhile at Linnan headquarters, Lilidel, the wife of Lord Adviser Jerrin—Clane's brother—poisons her husband when she discovers that he plans to make Clane his heir instead of their son Calaj. Clane's advisers urge him to seize power, but he decides against. He intends to take the captured Riss battleship, renamed the Solar Star, *and fly to a star sixty-five light-years from Earth. His hope is that other human beings survived the Riss-human war of five thousand years earlier, and that they will be able to help in the struggle against an enemy who refuses even to communicate with men.*

He expects the journey to take more than a year. As it happens, just about the time that the Solar Star *arrives at the twin planets of Outland and Inland, a Riss invasion fleet lands on Earth. Fortunately, for the incompetent Calaj government, before leaving Earth Clane compelled the psychoneurotic Calaj to sign a document ordering a vast system of refugee villages to be set up on farms. By the time Lilidel finds out what is going on, it is too late to stop the process. And besides she discovers that Calaj is being widely praised for the action. A mental case, he needs all the credit he can get. He has already murdered hundreds of people on impulse, and has alienated many of his supporters.*

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Clane more than a year out from Earth is disappointed to find that, though there are human beings on the Twin planets, they have an agricultural civilization. Quickly, however, the Outlanders show unusual qualities. They have an instantaneous mental transportation system. They trade with the Riss, and the Riss apparently dare not disturb them. There are other things, and it is only gradually that Clane realizes that they are actually primitives. Their science is a remnant science, and they don't even think of it as science. To them, their knowledge is a part of the nature of things, simple, ordinary, without any unusual features.

Ostensibly, their method of holding off the Riss is very simple. A pink flower called the chlorodel which grows everywhere constantly discharges chlorine into the atmosphere. This very active gas is poisonous to the Riss even in minute quantities.

Clane rejects the chlorodel as a general solution against the Riss. In his opinion, the Riss-human problem will not be solved by a purely defensive weapon, since the Riss could easily develop a gas that would poison the atmosphere of a planet for human beings. He has no desire to start any such suicidal war.

Since the Outlanders cannot teach him their system of mental transportation, he realizes that the Solar Star *must visit still another star system. This time he decides to go to a Riss-inhabited planet. However, before leaving, he makes an attack on a Riss battleship that has been collecting annual tribute from the Outlanders. He skillfully uses the Outlander transportation methods to get his men aboard the Riss battleship. Once aboard, they set off the booby traps which the Riss have set up on all their instruments and machines. The enemy ship is successfully destroyed.*

By means of captured maps, the Solar Star *heads for the nearest Riss system. Just before they arrive, Clane's wife, Madelina, bears him a baby boy, whom they name Braden.*

When they reach the Riss planet, Clane announces that a landing will be made. It must be held, he states grimly, against any and all assaults the Riss may make against it.

Part 3

XIX.

They came down on the dried-out, uneven hillside of what might have been a dead sea. Rock formations tangled that unpleasant and desolate terrain. The air was thin and cold in the morning, but by noon the heat had become a blistering thing.

The men were grumbling even as they set up their tents. Clane was aware of many a scowl sent in his direction as he flew slowly along within a few feet of the ground. And a dozen times when his ship came silently over a rock formation before dipping down into the next valley,

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he overheard fearful comments from big men whose courage in battle could be counted on.

Periodically, he landed to inspect the protector and molecular energy devices he had ordered set up. The protectors were the same instruments that had killed every man of the skeleton crews aboard the Linnan warships in the attack that had originally enabled him to seize the *Solar Star*. The molecular weapons had burned great gashes in the second Riss ship. He made sure that the destructive limit of each weapon was set at extreme range, and then he flew on.

He stood finally beside Czinczar, gazing out toward the bleak horizon. The barbarian was silent. Clane turned and gave his final instructions:

"Send out raiding parties. If you get any prisoners, report to me immediately."

Czinczar rubbed his chin. "Suppose they drop atomic bombs on us?"

Clane did not answer at once. From the hillside, he could see some of the tents. Most of them were hidden in the hollows behind crooked rock formations. But here and there he could see the thin, unsteady lines. They reached to the horizon and beyond—over thirty miles in each direction from where they stood.

An atomic bomb would kill everybody in its immediate vicinity. The titan wind would tear down every tent. The radiation, that deadly stuff, would bounce from the hard, glittering rock, and kill only the few men who were directly exposed.

That was for a bomb exploding at ground level. If it exploded in the air, if for instance the automatic controls of the molecular weapons forced it to explode at a height of twenty miles, the effect would be compressive. But at twenty miles the air pressure would not be too deadly, particularly for men who had orders to burrow into the rock under their tents, and *orders* that two of the four men assigned to each tent must always be in the rock burrow. The other two men of each unit were expected to be alert. It was presumed that they would hastily take cover if a Riss ship appeared overhead.

Clane explained his picture, and finished, "If they drop a bomb on us, why, we'll drop one or two on their cities."

His surface coldness yielded to his inner exultation. He laughed softly, and said, "No, no, my friend. I'm beginning to grasp the problem of two hostile civilizations in this vast universe. There's never been anything like it, before human and Riss collided. No planet can be defended. All planets can be attacked; everybody is vulnerable—and this time, here on one of their home planets, we have the least to lose."

He held out his hand. "Good luck to you, Great Czinczar. I'm sure you will do your usual thorough job."

Czinczar gazed down at the proffered hand for several seconds, and finally took it. "You can count on me, sir," he said.

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He hesitated. "I'm sorry," he said slowly, "that I didn't give you the sphere."

The frank admission shocked Clane. The loss of the sphere had been a major disaster, and only the terrible will power of the barbarian leader had restrained him finally from forcing the issue to a conclusion. Even then he had realized his need for such a man as Czinczar. He could not bring himself to say that it didn't matter. But since the confession implied that the sphere would be available on Earth, he said nothing.

Back on the *Solar Star,* he guided the ship from the weapon control room. A dozen men stood behind him, watching the various screens, ready to call his attention to any point that he himself might miss.

They cruised over cities—all of them were in mountain areas—and it didn't take very long to discover that they were being evacuated. Endless streams of small craft poured from each metropolitan area, unloaded their burden of refugees, and came back for more.

The spectacle exhilarated the other officers. "By all the atom gods," one man exulted, "we've got those skunks on the run."

Somebody urged, "Let's drop some bombs on them—and watch them scurry."

Clane said nothing, simply shook his head. He was not surprised at the virulence of the hatred. For two days he watched it swell and surge around him, and still it showed no signs of diminishing.

"I've got to change these automatic hate patterns," he told himself. But that was for later.

During those two days, he received periodic radio reports from Czinczar. Patrols had been sent out. That was one message. About half of them were back by the time the second report arrived.

"It appears," said Czinczar, "that an army is gathering around us. There is much activity on every side, and our patrol craft have been burned down by ground artillery at heights as great as eighteen miles. So far there had been no attack made on any of our machines from the air. It looks as if they are trying to contain us. Our men have captured no prisoners as yet."

The third report was brief. "Some air activity. No prisoners. Shall we try to go into one of their camps?"

Clane's answer to that was, "No!"

Seen from a great height, the problem of the Riss planet fascinated him. It seemed clear that a sharp clash was imminent. Considering how many individual Riss there were on the planet, it was hard to realize why not one had yet been captured.

As he flew over another city on the third day, and saw that it was still debouching refugees, he pondered a possibility. Send a patrol craft down. Intercept a refugee craft, burn the machine, and capture those aboard.

After some thought, he rejected that. In the first place, the Riss ma-

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chines kept to lanes. That suggested there were "protector" instruments spotted all along the route. No human being could hope to penetrate that line of death. That was also the reason why he refused to consider Czinczar's suggestion that patrols be sent into the enemy camps. The camps also would be protected.

The risk to a few men was quite unimportant, of course. But there was another reason for not testing the danger. He wanted reactions from the Riss. It was they who must force issues against the invader; and by the very nature of the issues they brought up, show what they feared.

On the third day, accordingly, his advice to Czinczar was still, "Wait and follow the pattern."

The passing of that night brought no unexpected developments. By mid-morning, Clane was observing that the refugee traffic had diminished to a trickle of trucking craft. He could imagine the tremendous relief that must be sweeping the populace. They probably believed that they had won the first phase of the engagement, or else regarded the assailant as too foolish to appreciate the advantage he had had.

Let them think what they pleased. Having achieved the safety of wide dispersement, they must now be ready for an active second phase. He was not mistaken in his analysis. Shortly before dark that afternoon, Czinczar sent the long awaited word: "Prisoner captured. When will you be down?"

"Tomorrow," Clane replied.

He spent the rest of the day, and part of the night considering the potentialities. His plans were ready about midnight. At that time he addressed a hundred group captains. It was a very sharp, determined speech. When he had finished, the men were pale, but they cheered him lustily. Toward the end of the question period, one of them asked:

"Your excellency, are we to understand that you are planning to be on the ground tomorrow?"

Clane hesitated, then nodded.

The man said earnestly: "I'm sure I speak for my colleagues when I say to you: reconsider. We have talked all this out among us many times during these long months, and it is our opinion that the life of everyone aboard this ship depends upon your excellency remaining alive. No great expedition has ever before been so completely dependent on the knowledge or leadership of one man."

Clane bowed. "Thank you. I shall try to merit the trust reposed in me." He shook his head. "As for your suggestion, I must reject it. I feel that it is necessary for me to question the prisoner we have captured. Why? Because on Earth I dissected the body of one of these beings, and I am probably the only person who knows enough about him for the interview to have any meaning?"

"Sir," said the man, "what about Czinczar? We've heard reports of his astuteness."

Clane smiled grimly, "I'm afraid Czinczar will also have to be pres-

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ent at the interview." He broke off. "I'm sorry, gentlemen, this argument must cease. For once, the commander must take as great a risk as any of his soldiers. I thought that was one of the dreams of lower ranks."

That brought another cheer, and the meeting broke up a few minutes later with everyone in good humor.

"I don't like this," said Czinczar.

Actually, Clane didn't either. He sat down in a chair, and surveyed the prisoner. "Let's think this over for a while," he said slowly.

The Riss stood proudly—at least that was the impression he gave—in front of his human captors. Clane watched him unhurriedly, preternaturally aware of a number of possibilities. The Riss was about twelve feet from him. He towered like a giant above the powerful barbarian soldiers, and theoretically he could leap forward and tear any individual limb from limb before himself succumbing to an attack.

It was not a point that need be taken too seriously, but still there was such a thing as being prepared for any eventuality. Surreptitiously, he moved his rod of energy into a handier position for defense.

Czinczar said, "It was a little too obvious. The men, of course, were jubilant at catching him, but naturally I asked detailed questions. There's no doubt in my mind that he sought captivity."

Clane accepted the analysis. It was an example of the alertness he expected from the brilliant barbarian leader. And besides, it was the eventuality that had made him take so many precautions.

Theoretically, everything he had done might prove unnecessary. Conversely, if his anxiety was justified, then the precautions would merely provide a first line of defense. In war, the best plans were subject to unbearable friction.

Clane took out his notebook, and began to draw. He was not an artist, but presently he handed the rough sketch to a member of his staff who was. The man examined the picture, and then secured a small drawing board from the patrol craft, and began to sketch with quick, sure strokes. When the drawing was finished, Clane motioned the artist to hand it to the Riss.

That huge monstrosity accepted the paper, board and all. He studied it with evidence of excitement, then vibrated the folds of his skin. Watching him, Clane could not decide whether he was showing approval or disapproval.

The Riss continued to study the paper, and finally reached into a fold of his skin and from some hidden receptacle drew out a large pencil. He turned the sheet the artist had used, and drew something on the blank side of the paper. When the Riss had it ready, it was Czinczar who stepped forward and took the drawing from him.

It was not, apparently, his intention to examine it, for he carried it over to Clane without glancing at

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what was on the paper. As he handed it to the mutation, he bent down for a moment, his back to the Riss, and whispered:

"Your excellency, do you realize that the two leaders of this expedition are concentrated here on this spot?"

Clane nodded.

XX.

Out of the corner of one eye, Clane caught a brilliant flash of light high in the sky. He glanced quickly around to see if anyone else had noticed it. One of the barbarian officers was craning his neck, but there was an uncertain expression in his face. He had the look of a man who couldn't be sure that what he had seen meant anything.

Clane, who had sat down so that he could, among other things, gaze upward without being too obvious about it, settled slowly back in the chair. He waited tensely for the next flash. It came abruptly. It was almost straight above, which worried him a little. But still he showed no sign.

This time, no one seemed to have observed the flash.

Clane hesitated, and then finally answered Czinczar's question with a question of his own. "Just what," he asked, "do you expect?"

The barbarian leader must have sensed the undertone of excitement in his voice. He looked sharply at Clane. He said slowly, "A Riss has allowed himself to be taken captive. He must have a purpose. That purpose could well be to insure that the forces behind him make their attack at a specific time and place. Why not at the moment and the area where the top leaders of the enemy expedition are interviewing their alien prisoner?"

Clane said, "You feel then that he would be capable of evaluating your rank and mine?" He spoke deliberately. There had been a third flash in the upper sky.

"He can put two and two together," said Czinczar. The barbarian was angry now. He seemed to be aware that he was only partly understanding what was going on. "And remember what Marden said about communicating with the Riss. That suggests they can read our minds. Besides"—he was suddenly sarcastic—"for the first time in our association, you've come like a potentate. You're the one person here sitting down. That's unusual for you on a public occasion. And for the only time in your life that I know about, you've put on the dress clothes of a Linnan temple priest. What are you trying to do—make him realize who you are?"

"Yes," said Clane.

He spoke softly, and then he laughed out loud, exuberantly. "Czinczar," he said at last, more soberly, "this is a test of something I saw during the attack against the Riss battleship on Outland."

"What did you see?" said Czinczar.

"Our molecular weapon showed up as being far more powerful than

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I had imagined. It did not actually help to destroy the other ship—I used it merely to distract their attention. But it burned away more than a foot of the hard outer shell of the ship wherever it touched. I subsequently discovered that it had a range of some twenty miles, and that aboard the ship it was synchronized to automatic aiming devices."

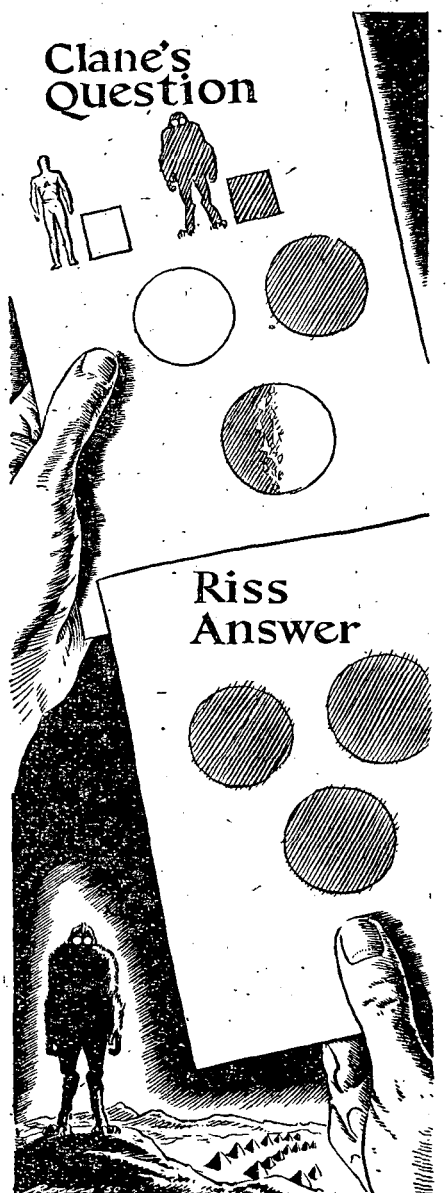
He showed his even, white teeth, as he smiled grimly. "Czinczar," he said, "this entire area is protected by molecular weapons that will with absolute precision burn an atomic bomb out of the sky at a distance of nearly twenty miles."

The barbarian leader's strong face was dark with puzzlement. "You mean, it will explode them that far away?"

"No. It burns them. There is no nuclear explosions, but only a molecular transformation into gas. Being small, the bomb is completely dissipated, the gas is caught by crosscurrents of air and its radioactivity spread over hundreds of square miles."

He expected a strong reaction. He was not mistaken. "Lord Clane," Czinczar said with suppressed excitement, "this is tremendous. All these months we have had this remarkable defensive machine, and didn't know it."

He stopped. Then more slowly, he said, "I am not going to assume, as I did with the chlorodel, that this is the answer to our requirements. A big ship like our own could fly over a solid rank of such weapons. It



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might suffer serious but not crippling damage, and it could come low enough for its protective space-time resonators to exterminate everyone below. What is our defense against that? Burrowing?"

"As fast as we can," said Clane, "we dive into the individual caves that your men have been digging, and crouch under several yards of rock."

Czinczar was frowning again. "All this doesn't explain the why of this byplay with our prisoner. Are you trying to force them to an attack?"

Clane savored the opportunity briefly, then he said quietly, "The attack has been on for nearly five minutes."

Having spoken, he raised the drawing the Riss had made and pretended to study it.

Around him, the wave of excitement reached its peak. Men called to each other shrilly. The echoes of the sounds receded into the distance, as other men farther away took up the cry.

During the entire period of turmoil, Clane appeared to be examining the drawings. Actually, with a singleness of purpose he watched the Riss captive.

The guards had forgotten the huge alien. They stood, craning their necks, staring up into the sky, where the flashes had become more numerous. With one word, Clane could have recalled them to their duty. But he decided against saying anything.

The question was, how would the creature react when he finally realized that the atomic attack was a complete fizzle?

For a few seconds, the monster maintained his calm, proud bearing. Then he tilted his head back, and stared earnestly up. That lasted less than half a minute. Abruptly, his gaze came down from the upper air, and he looked quickly around him. For a moment his swift eyes focused on Clane, who blinked rapidly, but did not look away.

It was an effective device. His bent head suggested that he was immersed in the drawing. By blinking his eyelids, he partially concealed the fact that his eyeballs were rolled up high into their sockets. The Riss' gaze passed over him, and the Riss made his first purposeful move.

He reached into a fold of his skin, started to draw something out—and stopped, as Clane said softly almost under his breath, "Don't do it. Stay alive! I know you came here to sacrifice yourself, but it's not necessary now. It would serve no useful purpose. Stay alive, and listen to what I have to say."

He didn't expect too much from that. Telepathic communication between an alien who could read minds and a human being who couldn't must surely be a fragile thing. Nevertheless, though he still did not look directly at the Riss, he saw that the creature continued to hesitate.

More firmly, but still under his breath, Clane said, "Remember the drawing. I still don't know what your reaction was—I can't take the

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time to look—but I suspect it was negative. Think that over. A first judgment isn't necessarily the best. Five thousand years ago, man and Riss nearly destroyed each other. And now, the Riss have taken actions that will start the whole struggle over again. So far we have not dropped a single bomb, nor have we used the resonator. That was deliberate. That was designed to show that this time human beings want a different arrangement. Tell your people that we come as friends."

And still it was hard to tell what the reaction was. The alien remained as he had been, one "hand" hidden in the folds of his skin. Clane did not underestimate the possibilities. In dissecting the body of the dead Riss on Earth, he had discovered natural skin pockets big enough to conceal energy rods.

He had warned Czinczar to be on guard, but had asked him not to make a search. The important thing was that the Riss feel free to act.

Beside him, Czinczar said in a monotone, "Your excellency, I think our captive is nerving himself to do something violent. I've been watching him."

So at least one other person had not forgotten the danger. Before Clane could speak, Czinczar went on, sharply, "Your excellency, I urge you to take no chances. Kill him before he pulls a surprise on us."

"No," said Clane. His voice was on a conversational level. "I intend to give him a patrol craft, if he'll accept it, and let him escape. The choice is up to him."

As he spoke, he raised his head for the first time, and gazed squarely at the Riss. The creature's huge, glittering eyes glared back at him. There seemed little doubt but that he knew what was expected of him.

The conflict between his will to live and the unconscious attitudes and beliefs that had brought him here to sacrifice himself was terrible to see. He grew visibly rigid in every muscle.

There was no immediate change in that tense tableau. The Riss stood on a rock ledge looking up at Clane and Czinczar who were higher up on that barren and uneven hillside. Beyond the alien, the tents of the barbarian soldiers were partly visible among the rocks. They stretched as far as the eye could see. A minute went by. The very passage of time, it seemed finally to Clane, was favorable. He relaxed ever so slightly, and said to Czinczar:

"I'd like to know what he drew in answer to the drawings I had made up. Will you look at them, while I watch him? I imagine you'll have to study mine first if you hope to understand his reply."

Though he had not said so, he was also interested in the barbarian's own reaction.

Without taking his gaze from the Riss, he held up the drawing board. Czinczar took it, and said presently, "I'm looking at your drawing. There are three planets shown here. One is

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completely shaded. One is all white, and on the third the mountain areas are shaded, and the foothills and flat sections are white. Am I right in thinking these drawings *are* meant to represent planets?"

"Yes," said Clane.

He waited. After a little, Czinczar said: "The legend at the bottom of the sheet shows the figure of a human being, and opposite that a white rectangle, and below that a Riss with a shaded rectangle opposite his figure."

"That's the explanatory legend," said Clane.

There was a long pause, longer than Clane expected from a man so astute. And yet, on second thought, he was not surprised. It was a matter of attitudes and beliefs. It was the whole nerve process of accepting a radically new notion. The reaction that came finally did not surprise him in the slightest.

"But this is ridiculous," Czinczar said angrily. "Are you seriously suggesting that Riss and human beings share one out of every three planets?"

"That's just a guess," said Clane. He made no further attempt to justify the idea. Fifty centuries before, Riss and human had not even been prepared to share a galaxy. The mental attitude involved seemed to be one of the few things that had survived a holocaust war.

He waited. When the barbarian spoke again, there was satisfaction in his voice. "Your excellency, I am examining his answer. He has drawn three planets, all shaded in. I'd say he rejects your suggestion of sharing."

Clane said steadily: "He's had time to transmit my plan by mental telepathy. The idea may spread rather rapidly. That's all I can hope for at the moment."

Actually, the basic situation was quite different from what it had been long ago. This time, men and Riss alike could look back and see the disaster that had befallen their ancestors.

This time, one man believed in co-operation.

One man, sitting here on this distant enemy planet, accepted the reality that there would be difficulties. Accepted the rigid intolerance of man and Riss alike. Knew that he would be regarded as a fool, enemy of his kind. And still he had no intention of yielding his idea.

He saw himself, poised for one minute of eternity at the very apex of power. In all man's history, this moment, this combination of events, had never occurred before, and possibly never would again. A few years from now what he knew of science would be common knowledge, shared by thousands of technicians. It would have to be, if the human race hoped to survive in competition or co-operation with the Riss. Already, he had trained scores of officers. The trouble was, because of his greater background, he learned a dozen things while they learned one.

That fact shaped the difference.

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Therein lay the tremendous opportunity. Culturally, industrially, that was bad for the human race. Politically, it made the moment.

No one could stop him. None could deny him. He was Lord Clane Linn, potential Lord Leader, commander in chief of the *Solar Star,* the only man who understood something about all the machinery aboard. He had never felt more alert, never sharper of mind, and he hadn't been sick for years.

Czinczar cut across his thought, a note of exasperation in his voice. "Your excellency, if all your schemes didn't work out so well, I'd say you were mad. The Riss attack against us here has been tactically and strategically wrong, not well planned, not well conducted. There have been no explosions for several minutes. If I were the commander on the other side, what has already happened would be only the beginning of a major assault. Logically, there is no limit to the sacrifice a race should make in defending its planet."

He went on in a puzzled tone, "There's something about the attack that we're not seeing, a factor which they're taking into account but we're not. It's holding them back."

He broke off. He said ironically, "But what about this fellow? How can you solve the problem of the Riss galactically if you can't even persuade this one individual?"

Clane said quietly, "All he's got to do to get a patrol ship is bring his hand out into the open, slowly, inoffensively—"

He stopped. Because the "hand" was coming out. The Riss stood for a moment, studying Clane. Then he walked over to the patrol vessel Clane had mentally indicated. Silently, they watched him get into it, and take off.

When he had gone, Czinczar said, "Well, what now?"

The barbarian leader had a habit of asking such disconcerting questions.

XXI.

Clane returned to the *Solar Star,* and considered. What *should* the next move be?

Go home? It seemed too soon.

He spent half an hour playing with baby Braden. The child fascinated him. "Here," he thought, not for the first time, "is the secret of all progress."

At the moment Braden had no ideas of his own, no unchanging attitudes or beliefs—except possibly those that derived from the way the nurses and Madelina had handled him. There were possible subtle responses to rough or gentle treatment that should not be lightly dismissed.

But he knew nothing of his origin. He did not hate the Riss. Brought up with a young Riss, the two might even develop friendly relationships—though that was not an important solution to the Riss-human problem. It couldn't be carried out on a big enough scale. Besides, it would be limited by other associations.

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He left the baby finally, and settled down in a chair in the control room. There, surrounded by the panoply of instruments that controlled great machines, he told himself, "It's a matter of integrating what I know."

He had a feeling about that. It seemed to him that virtually all the facts were now available. There was one possible exception. What Czinczar had said about the unsatisfactory extent of the Riss attack.

Frowning, he went over in his mind the sequence of events on this Riss planet. And Czinczar was right, he decided.

He was still thinking about it when the radio clerk brought him a message.

Dear Lord Clane:

More prisoners have been captured. I urge you to come down immediately. I have the missing factor.

Czinczar.

Clane made his landing shortly after lunch. Barbarian guards herded the prisoners from a small pocket in the rocky hillside.

They sidled over, skinny, bright-eyed men with a feverish look about them. They were unmistakably human. Czinczar made the introduction. His golden voice held the full flavor of the occasion.

"Your excellency, I want you to meet the descendants of the human beings who used to occupy this planet—before it was captured by the Riss five thousand years ago."

Clane had had just a moment's warning—that one look at the prisoners as they came up. It was all he needed. His mind took the impact of the introduction. He was able after a moment to study them, and it seemed to him that he had never seen such wretched looking human beings. The tallest of the group—there were eight of them—was no more than five feet three. The shortest was a little old wizened individual about four feet six. It was he who spoke.

"Hear you come from Eart'."

His accent was so different from the Linnan, that his words sounded like gibberish. Clane glanced at Czinczar, who shrugged, smiled, and said, "Say, yes."

Oddly, the meaning came through then, and thereafter a painfully slow conversation was possible.

"You're the big boy?" the creature said.

Clane thought that over, and nodded. The little old man came closer, pursed his lips, and said hoarsely, "I'm the big boy of *this* bunch."

He must have spoken too loudly. One of the other men, who had been standing by, stirred, and said, in an outraged tone, "Yeah? Listen, Glooker, you do the talkin', we do the fightin'. If there's any big boy in this bunch, it's me."

Glooker ignored the interruption, and said to Clane, "Nothin' but intrigue and complaint all the time. By the holy sphere, you can't do a thing with them."

Clane's mind jumped back to the

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desperate political and economic intrigue of Linn. He started to say with a smile, "I'm afraid intrigue is a common heritage of limited associative balance—" he stopped. He did a mental double-take, caught himself, and said with a tense calmness, "By the *what?*"

"The sphere. You know, it rolls up and down. It's the one thing that never changes."

Clane had complete surface control of himself again. He said, "I see. You must show it to us sometime."

He turned casually to Czinczar, "Did you know about this?"

Czinczar shook his head. "I talked to them for an hour after they were brought in, but they never mentioned it."

Clane hesitated, then drew the barbarian aside. "Brief me," he said.

The picture was ordinary enough. Man had gone underground. During the long struggle, gigantic machines had created a universe of caves. Long after the burrowing machines were meaningless hulks of metal, the caves remained.

"But," said Clane, puzzled, "how did they hold off the Riss? Just going into a cave wouldn't be enough."

Czinczar was smiling. "Your excellency," he said, "we proved the method right here on this soil." He waved at the rocky, uneven terrain, the desolation that reached to every horizon. "They had, among other things, the 'protector' device—"

Clane flashed, "You mean, they know how to make them?" He thought of his own fruitless efforts to duplicate the Riss alloys.

"It's a part of life to them," said Czinczar. "They make the right alloys as a matter of simple training. They fashion them together because . . . well . . . that's the way things are. They *know.*"

Clane had a limp feeling of excitement. It was the same story over again. In Linn, spaceships existed in a bow and arrow culture. On Outland, an inconceivably advanced system of transportation, and telepathy, were accepted realities in a simple, agricultural civilization. And now here was the same evidence of scientific wonders as part of a commonplace life. A technique, if remembered and passed on from one generation to the next, was not something marvelous. It was *the* way of doing something.

Such folkways had their limitations, of course. The people did not have open minds. They resisted change. The Outlanders were extreme examples of that. The Linnans as a nation were almost equally set in their decadence. These little people were harder to judge. In their confirmed and desperate existence, they had little opportunity for growth. And so, because of their environment, they were as rigid as any Outlander.

The deeper meanings of such things remained as obscure as ever.

Clane broke his thought. "Let us make arrangements to visit these people in their home, tomorrow."

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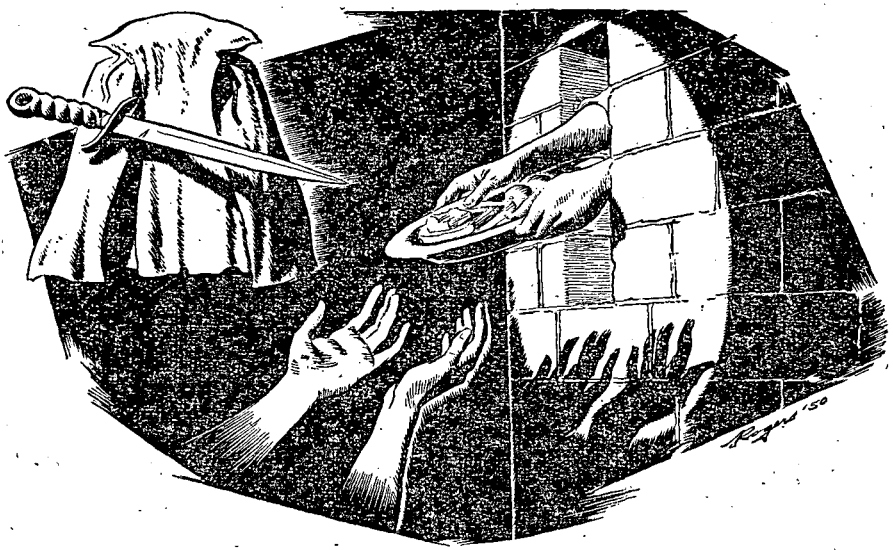

They flew over country that was rocky and barren at first. Abruptly, the soil grew greener. A river burst into view, and wound along among trees and heavy undergrowth. And still there was no sign of Riss habitation.

Clane commented on it to Glooker. The little man nodded. "Air's too heavy for 'em. But they won't let us have it." He spoke sourly.

The mutation nodded, but said nothing more.

The entrance to the cave surprised him. It was a huge concrete piling constructed against a hillside, plainly visible for miles. Their patrol craft came down outside the range of the resonators, and the erstwhile prisoners went forward alone into the "protected" area. They came back, "photographed" the visitors, and soon they were being led down a brightly lighted concrete causeway. Spindly bodied men and women, pitiful child mites came out of wood and stone cubbyholes to stare with their feverish unhealthy eyes at the procession of strangers.

Clane began to feel his first admiration. The scene was almost literally out of a nightmare. And yet these half humans with their stunted bodies and their desperate, tense, anxious minds, had fought off the science and military might of the Riss empire. They had burrowed into the soil; by withdrawing into that artificial underground world, they had virtually cut themselves off from sunlight. But here they were, alive, and as active as ants in an anthill.

They squabbled, fought and intrigued. They had their own caste system. They followed old marriage customs. They lived and loved and

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reproduced in the very shadow of the Riss menace. Their average life expectancy was about thirty-five Earth years, as near as Clane could calculate it.

The procession came to a larger cave, which was occupied by several women and swarms of children, but only one man. Clane watched alertly as the man, a roly poly individual with thin lips and hard blue eyes ambled forward. Glooker introduced him obsequiously as Huddah, the "Boss Boy".

The mutation had his own way of measuring conceited individuals. So now he made his first attempt to control the sphere, which these little people had somewhere in this tangle of caverns.

The problem was, was the sphere close enough?

An instant after he had thought the cue, it flashed up over his head. A hundred throats screeched with wonder and awe.

There was no trouble.

On the return trip, Clane ordered Czinczar to re-embark the barbarian army.

"The existence of a remnant human race on this planet," he explained, "points up emphatically what we discovered. Given certain weapons, man can survive a Riss attack. We'll take along enough 'little men' technicians to start construction on Earth of the two main weapons. As more and more people learn the process, we can count on our defenses holding."

He added, "That, of course, doesn't give us back our planets. It's unfortunate but the defense weapons will work equally well for the Riss."

He glanced sharply at Czinczar, expecting a reaction. But that barbarian's lean face was impassive. Clane hesitated, then went on, "It is my plan before we leave here to turn out millions of photostats of my drawing, showing how we propose to solve the Riss-human hostility. We'll flutter them down over various cities and over the mountain sides, so that every Riss becomes aware of the basic idea of sharing."

Czinczar made a sound as if he were choking. Clane said quickly, "We mustn't forget the Riss also have a problem. Apparently, they need a more rarefied atmosphere than man. They can stand the dense air at sea level on Earth, and here, but for everyday living they've got to be high up. That greatly limits the habitable areas available to them. Man has not been overly sympathetic to the difficulties involved, in fact aggravated them."

Czinczar broke into speech at last, "How do you mean?"

Clane said slowly, "From all accounts, men of the golden age discovered how to release the oxygen from the crusts of otherwise barren planets and moons. Presumably, the Riss knew how to do that also, but they had a terrible disadvantage. They would want the process to stop sooner than would man. I can just imagine the glee of human beings as

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they forced an ever thicker atmosphere on planet after planet."

Czinczar said in a remorseless tone, "It is natural that each race fight to the limit for survival."

Clane said sharply: "That's all very well for intelligent beings who think on the animal level. Man and Riss *must* rise above it." He broke off grimly, "You understand, that we will not allow the Riss in the solar system, nor should human beings aspire to share the main Riss system. The home planets have to be inviolate."

"How are we going to get them off?" said Czinczar.

Clane made no direct answer.

Back on the ship, Czinczar offered only one important objection when Clane told him they would have to make a stopover on Outland.

"What about the people of the solar system?" he asked uneasily. "For all we know, a major attack has already taken place. We do know that as of now, human beings have no resonators or energy beams to protect them."

Clane was grim. "It takes time to conquer an inhabited planet. That's what I'm counting on." He added harshly, "If we go back right now, we could only fight the Riss on equal terms. That would be bad for us, since they have the ships and the weapons, and the endless equipment for making more."

"And how will the situation be changed if we go to Outland first?"

"I'm not sure." Clane spoke frankly.

"I see. Another idea at the back of your mind?"

"Yes."

Czinczar was silent for several seconds. Then his eyes showed laughter. "I support it," he said, "sight unseen."

He held out his hand. "Your excellency," he said earnestly, "I'm your man. From this moment on, no more schemes, no opposition. I salute the future Lord Leader of Linn, of whom I herewith request the rank of loyal ally."

It was an unexpectedly complete surrender. Clane blinked, and swallowed hard. Momentarily, he felt overwhelmed. Then he caught hold of himself and said with a faint smile, "I'm not Lord Leader yet. It will take time to make influential people aware of me again. There will probably be a difficult preliminary."

There was no need to elaborate on that. The politically wise barbarian nodded, his lips pursed.

Clane went on, "We now have two spheres, one in reserve on Earth—" His eyes met Czinczar's, seeking confirmation.

The latter agreed. "Yes, two. You can have the one in the solar system at any time."

Clane continued in a firm voice, "As I see it, the sphere is the primitive version of the transport system developed on Outland and Inland."

"And so—"

"Control of the cosmos." Something of the fire of the thought that

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was in his mind enriched his voice. "Czinczar, have you ever wondered how the Universe functions?"

The barbarian was sardonic. "I was born, I am alive, I shall die. That's my function. Can you alter the pattern?"

Clane smiled wryly. "You strike too deeply, my friend. I'm just now becoming vaguely aware of the forces that are operating inside me. They're more intricate than the physical sciences. I intend to leave them alone till I have more time."

He paused, frowning. "Perhaps that's an error. How dare a man who doesn't understand himself propose to settle the affairs of the Universe?"

He shrugged. "It can't be helped. My hope right now is that, with the sphere to help him, Marden will be able to teach me their system."

Marden drew back curiously to let the men carrying the sphere and its container enter his house. They set it down, as Clane said, "Ever see anything like this before, Marden?"

Marden was smiling. The sphere rose up from the container, and took up a position over his head. "An artificial opening," he said. "I've heard of them. They were the beginning."

He added, "If I had known you had such a thing as this, I would have taught him"—he nodded at Clane—"how all this works when he first talked about it."

Clane said, "Will it help me to read minds?"

Marden was tolerant. "That will take a few years. The rest you can start doing immediately with the sphere to help you."

Afterwards, Czinczar said: "But how *do* you expect to use the sphere against the Riss? You told me yourself it would not be decisive."

Clane evaded answering. The idea in his mind was so intricate in its scientific concepts, so vast in scope, that he dared not put it into words.

Besides, there was much to do first.

The trip home was long and tiring but not altogether wasted. Several dozen people aboard had gone insane, and there were any number of tangled minds and eccentric characters. Clane studied them, tried techniques of therapy on them—and again and again went back to baby Braden, the wellspring of his own interest.

It seemed to him that in the child he would find the beginning of the normalness and abnormalness of the adult.

The baby made as many movements with his left hand as with his right. He was not interested in objects held farther away than two feet. But if an article was brought closer than that, he would usually—though not always—reach for it, as often with his left hand as with his right.

Given something that he could grab hold of, he could be lifted into the air, his own strength supporting him. He did this equally with either hand, but each time used only his

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fingers. His thumb was still a useless appendage.

He showed marked symptoms of fear after a loud noise, a pain stimulus, or when subjected to a sudden sense of falling. Nothing else could alarm him. He was not afraid of animals or objects whether large or small, no matter how close they were brought. And he liked being stroked under his chin.

Other babies aboard, given the same tests, responded similarly.

Many times, Clane pondered his observations. "Suppose," he wondered, "that *all* babies turned out to have the same instinctive reactions as Braden and the ones I've tested. In other words, basically they don't seem to be either right-handed or left-handed. They're not afraid of the dark. Apparently, they learn these things. When? Under what conditions? How does one baby become irresponsible Calaj, another one ruthless, brilliant Czinczar, and a third a field laborer?"

There was one way, he discovered, in which Braden differed from the other babies of his own age group. When a blunt object was drawn across the bottom of his foot, all his toes flexed in one direction. Every other baby under a year old flexed the big toe upward and four downward.

The dividing line seemed to be one year of age. Of the nineteen older children Clane tested, sixteen reacted like Braden. That is, their toes all flexed in the same direction. The other three continued to react like normal babies under a year old. Each one of the three was a recognized problem child.

It was highly suggestive to Clane that Braden at four months of age should have the same responses as much older children. Was here perhaps evidence that his son had inherited the supernormal stability which he suspected in himself?

He was still deeply involved in the whole intricate problem of sanity when the *Solar Star* entered Earth's atmosphere. That was nine hundred and seventy-seven days after its departure.

XXII.

Before landing, Clane sent out patrols. Their reports were encouraging.

His estate was unharmed, though a large and noisy refugee village had grown up starting about two miles from the house.

According to the accounts brought back by the patrol commanders, some four hundred Riss battleships were in the solar system. They had taken possession of most of the mountain areas on the various planets and moons, and were busily consolidating their positions.

There had been no effective resistance. Army units, when cornered or ordered to fight, were wiped out. Human civilians who were sighted by the enemy, or who had been unlucky enough to be on the scene of a landing, were blasted to a man.

Immediately after their arrival,

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the invaders had made a mass attack on nearly half a hundred cities. About two million people were caught by the hellish atomic explosions; so the report went. The rest successfully reached their farm havens, and were safe.

For more than a year, no bombs had fallen. And even in those first deadly days, not a single lowland city was attacked. The Riss concentrated their colossal bombs on foothill cities and on mountain cities located less than thirty-five hundred feet above sea level.

The stupid and the thoughtless among the refugees noted both the commissions and the omissions. And for months they had been trickling back to the undamaged centers. There was need for swift action. And yet—Clane shook his head.

And yet he operated within the limitations imposed by his human as well as enemy environment.

"We'll set up defenses around the estate first," Clane told Czinczar. "It'll take about a week to put up the resonators and the molecular weapons, and start work on the caves. While that's being done, I'll try to get my spy organization together."

Everything took time, thought and the most careful preparation.

Liftboats hovered in the night. Shadowy figures stood on the ground. Small craft floated down out of the blackness towards lights arranged in a certain pattern. Such rendezvous were old in Clane's experience, and he took them calmly. For years he had dealt through agents, listened to accounts of scenes witnessed by other eyes than his own, and he had a practiced skill in building up the resulting pictures, so that many times he could see things that the spy had not noticed.

Each meeting with an agent followed the same general pattern. The individual remained in the darkness so far as other agents, also on the scene, were concerned. There were slaves present to insure that the men and women were fed, but the meal itself was handed through a narrow slit of a window to a pair of hands that reached out of the night. The meal was eaten by a shadowy human being who stood in a thin line-up of his own kind. It was seldom, however, that individuals spoke to each other.

Each agent reported first to three officers. The report was verbal and delivered out of the darkness to the officers, who themselves remained hidden by the darkness. If even one of the tribunal decided that the story merited further consideration, the spy was passed on to Clane.

The next step was precautionary. The agent was searched, if a man, by a man; if a woman, by a woman. Most of the agents were old at the game and knew each step, so that they offered no objections when they entered Clane's private patrol craft and for the first time during the interview, had to show their faces.

Gradually, in this way, as the

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night passed, the over-all picture of the past two and a half years came through to Clane.

The last agent finally departed, and the faint sound of their small craft was scarcely more than a whisper in the intense darkness that settled down after the false dawn. Clane returned to the spaceship and considered what he had learned.

Lilidel and Calaj knew of his return. It showed swift spy work on the part of their supporters. But the information pleased Clane. They would spread the news of his reappearance much faster than he could do.

He was not surprised to learn that Lilidel already regarded him as a deadlier danger than the Riss. To her, government was a personal possession. The fact that she herself had no idea what to do in this national emergency meant nothing. Regardless of consequences, she intended to cling to power.

Since it would take time to reestablish his contacts, Clane presumed that she would have time to take some action. With all the thoroughness of which he was capable, he set about the task of plugging up possible loopholes in his defense system.

To begin with, he concentrated on the refugee village.

XXIII.

The business manager of his estate, a former slave, had registered for him under the refugee law. The manager, who had in his day been a high Martian government official, reported that at the time of registration, more than a year before, he had noticed nothing unusual in the way his papers had been handled. The picture he gave of hastily organized clerical staffs working in confusion was typical of other areas where the same law had been introduced—without Lilidel being aware of it—and it satisfied Clane up to a point.

Because of the acreage of his estate, he had been assigned three hundred families, totaling one thousand ninety-four persons. It was a village full of strange people. When he went down to look them over on the day after his return to the estate, it seemed to Clane that he had never seen such a motley crowd. On inquiry, he discovered that he had been assigned the inhabitants of a section of a single street. On the surface, that looked fair and seemed to indicate that his farm was being handled as objectively as were the others. There was a full quota of human beings, sensible and foolish, short and long, fat and thin, clever and stupid—an ordinary cross section of any city's population.

Clane decided not to let it go at that. It took only one assassin to kill one or more people. Such a man would need only one opportunity, whether gained by chance or design. It was too easy to kill, and no man or woman in history had ever recovered from that particular type of catastrophe.

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He concentrated the attention of nearly half his spies and slowly, as the days passed and the reports came in, realized that he had given them an assignment which could never be satisfactorily completed.

He had a file made up for each family and in each file he had trained clerks enter the information that came in about individual members of the family. It became apparent that part of each person's life history was not available.

In his determination to penetrate that darkness, he organized a bulletin board newspaper, full of chatty information about the doings and backgrounds of the members of the group. As the new village grew, his spies, taking on the role of friendly reporters, interviewed each adult and each child over ten years old, ostensibly for the bulletin. Some of the spies considered the age limit too low, but Clane was insistent. The history of Linn, particularly of more ancient times, was full of accounts of the bravery of very young people in times of emergency.

His hope was that he might isolate the assassin. He looked for hesitation and reluctance in answering questions. He wanted the diffident refugee marked off as a person who had possibly murderous reasons for withholding information.

As it turned out, the agent listed as suspects seventeen men and nine women. Clane had them arrested and set down in a more distant area.

And still he was not satisfied.

"It isn't," he told Madelina unhappily, "that I'm abandoning the proposition that people must rise above themselves in this crisis. But a few unco-operative individuals could cause disaster."

She patted his arm affectionately. She said, "What a man you are for worrying."

She was a slim, straight girl at this time, with a fine, sensitive face. All her emotional intensity remained, but it was concentrated now in the normal channels of husband and child. She embraced him abruptly, impulsively.

"Poor, sweetheart, you have to think of so many things, don't you?"

That day, also, went by without incident. Through his spies, Clane watched every horizon of human activity. The reports from Golomb, where the government was, stifled once and for all any will he might have had to co-operate with the Lilidel group.

The incredible Calaj had brought back the games. Men and animals were once more dying in the arena to provide sport for the court. At night, government buildings were converted into theaters and dance halls. Often, the merrymakers were still at play when the clerks arrived in the morning to begin work. The Lord Adviser had taken an interest in the army. Thousands of men were being drilled, so that they could assume formations which spelled out phrases like "The People Love Calaj."

Over in the mountains, a second

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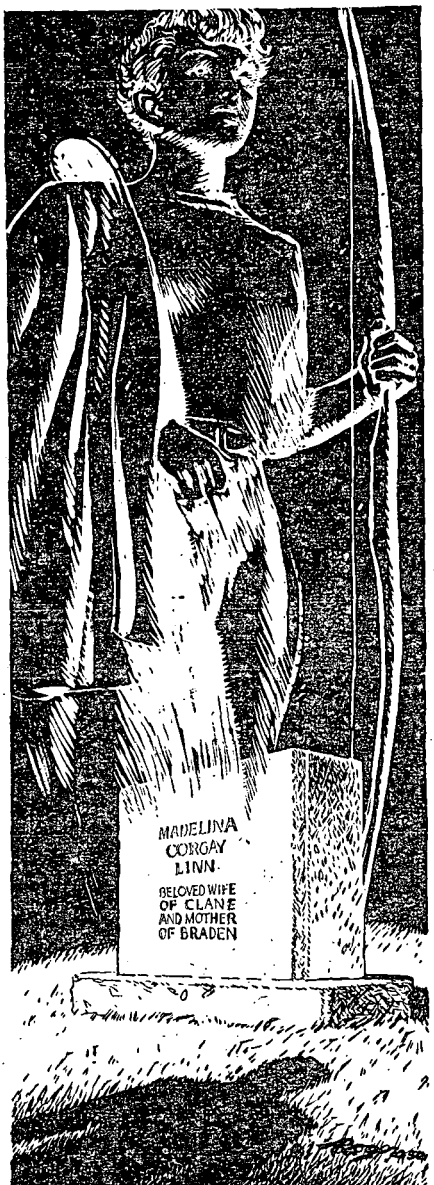

Riss expedition arrived. Thousands of monsters disembarked. Czinczar, who reported the arrival, sent along an appeal:

Your Excellency:

How are you going to drive these creatures from the solar system if you do not even have control of Linn? Please take action without delay.

Clane replied that he was training clerks for the first phase of government seizure. He pointed out that it was an intricate task. "A leader," he wrote, "has to work with human beings. This limits all his actions and controls his destiny. As you must know better than most people, I have tried to transcend such obstacles. I have thought in terms inviting men to do their duty to the race, and disregard such things as who shall be boss and who shall obey. I still hope that we will have such a spontaneous demonstration of will-to-co-operate for the benefit of all such as has not been seen in generations.

"At the moment, in spite of the risks, I am moving forward a step at a time. I agree with you that it is essential that I have control of the state for some years."

He had barely dispatched the message when one of his guards in a patrol craft made an emergency landing in the garden, and reported that a score of Linnan spaceships were approaching.

Even as he told of them, the dark shapes of the large naval vessels grew visible in the distance.

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XXIV.

They came in four lines of five each, and settled on the ground about four and a half miles from the house. They had landed in such a way that their air locks faced away from the estate. For a while there was a great deal of activity that Clane couldn't see. He guessed that men were disembarking.

Just how many men, it was difficult to decide. On space flights, these big machines carried complements of only two hundred officers and soldiers. But on such short trips as this fifteen hundred or two thousand per ship was possible.

It quickly became apparent that a very large number of men indeed was involved, for within an hour hundreds of groups of them swarmed over the hill and began to spread out in an enveloping movement.

Clane watched them uneasily through his Riss vision system. It was one thing to have a defense system that could kill every man now approaching. It was quite another actually to kill them.

The possibility that he might have to do so brought a return of his old anger. He wondered grimly if the human race deserved to be perpetuated. As in the past, he decided in favor; and so there seemed nothing to do but to warn the approaching army.

Both the molecular beams and the resonators were set to react in their terrific fashion at two miles against all craft to which they were not attuned.

He flew alone to that perimeter, taking a loud-speaker hookup with him. He set the Riss liftboat to follow a course just within the death line. At a hundred yards, he was not completely out of range of a good archer, but the metal walls of the machine would give ample protection.

The men nearest him were now little more than two hundred yards away. Clane rumbled out his first warning. In a clear, mechanical voice, he described the line of death, indicating trees, shrubs and other landmarks that constituted the perimeter. He urged those within hearing to send warnings to soldiers farther away. He finished that first urgent message with the words:

"Test this. Send animals across, and watch the result."

He didn't wait for their reaction, but flew on to make sure that other groups also received the same warning. When he turned back, he saw that it had stopped them about fifty yards from the demarking line. Consultations took place. Presently, messengers in small, fast ships flew from group to group. Satisfied, Clane settled to the ground, and waited.

There was another pause in the activity of the groups of soldiers, and then a small patrol ship landed among the nearest group. Traggen climbed out of it and stood with a megaphone in his hands. He started forward, but he must have known of

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the warnings for he stopped after proceeding less than ten yards. He raised the megaphone and shouted:

"The Lord Adviser Calaj, who is personally commanding these troops, orders you to surrender immediately."

It was interesting to Clane that as far as the eye could see there was no sign of anyone even remotely resembling the Lord Adviser Calaj. He said, "You tell his excellency, the Lord Adviser Calaj, that his uncle would like to talk to him."

Traggen said coldly, "His excellency does not talk to outlaws."

Clane said quickly, "Have I been declared an outlaw?"

Traggen hesitated. Clane did not wait for him to answer.

He called, "Please inform his excellency, Lord Calaj, that unless he comes forward to talk to me, I shall ride along the perimeter here telling the truth about him to the soldiers."

Clane paused with a wry smile. "I forgot," he said, "you can't tell him that, can you? Better put it like this. Tell him that I threaten to fly along and tell *lies* about him to the soldiers."

He finished, "I'll give him ten minutes, so you'd better hurry."

Traggen hesitated, and then turned and went back to his machine. It rose from the ground, and flew back towards the ridge more than two miles away. Clane did not bother to watch it land. He flew up and down in front of the soldiers, pausing before each group to tell a ribald joke about himself. In analyzing the popularity of certain of his officers, during the barbarian war, he had assumed that no officer could actually be liked for himself alone—the average soldier simply didn't have the opportunity to find out much about the real character of his commander.

So it must be something else. He watched and listened, and finally selected a number of coarse jests which poked fun at authority. Simply by telling one or two of them, he changed the attitude toward him of most of the soldiers who heard his pep talks. According to reports, he came to be regarded as a good fellow. He wasn't, but that made no difference. The so-called humor was a magic key to their good will.

Civilians, naturally, had to be handled differently, a fact which old soldiers sometimes forgot.

The question was, would these men, who had been with Jerrin on the planets, who knew little or nothing of what Lord Clane Linn had done against Czinczar, and who were now supposed to capture him—would they also laugh at his jokes?

They did, almost to a man. Entire groups rocked with laughter. A few officers tried sternly to stop them, but they were outnumbered. At the end of ten minutes, Clane returned to his original stopping point, satisfied that he had done what he could to turn the men in his favor.

Just what good it would do was another matter.

He forgot that, for a long, strange

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and wonderful procession was approaching.

First of all came scores of brightly colored patrol craft. They gyrated as they flew, like a well organized pyrotechnic display. In a final chromatic swirl, they gracefully took up positions directly in front of Clane. It was skillfully, even brilliantly, done, so that not until they were stationary did he realize their new position spelled out one word. The word was "C A L A J".

And now came the most wondrous machine of all—a large, open-decked patrol ship. It was a flower float, gorgeously done up. A little ornate, perhaps, a little out of key, and rather too magnificent for its purpose—Clane assumed that its purpose was to set off the Lord Adviser.

That was an error in judgment on Calaj's part. He was hardly noticeable. He had selected a bright uniform that blended in rather well with the flowers. The red coat could have been a design of carnations or roses, or any one of a dozen flowers. The blue and yellow striped trousers were well matched by nearly half a score of similarly colored floral decorations.

It seemed clear that the new Lord Adviser had already achieved for himself the dangerous environment where no one dared to advise him.

As Clane watched, the colorful monstrosity of a ship settled to the ground. Other craft landed all around it, and presently Traggen came forward with a megaphone.

"His excellency, Lord Calaj in person, orders you to surrender."

The farce was to continue.

Clane answered, loudly enough for Calaj to hear, "Tell the child in the flower box that I want to talk to him."

As Traggen turned indecisively back to the flower float, Clane saw Calaj pick up a megaphone. A moment later his shrill voice commanded nearby soldiers to go forward and seize Clane.

"Have no fear," Calaj finished boldly. "His only power is that of hypnosis, and you don't have to worry about that. I've got a cage here for him. Lock him inside it, and bring him to me."

Clane smiled to himself, grimly. Calaj had apparently explained to himself why he had been so subservient the last time he and his uncle had met. Hypnosis. It was a simple method for covering up weakness.

Clane waited for the reaction to the boy's commands.

Both the soldiers of the group and their officers seemed uncertain. There was no display of dash and *élan,* no eager surge forward to show the commander in chief that here were men ready and willing to die for him. The officers gazed unhappily at Traggen, but if they expected him to help them, they were mistaken. Traggen snatched up his megaphone, and bellowed through it:

"You will obey the commands of

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your Lord Adviser, or suffer the consequences."

That brought action. A dozen soldiers, with one officer in command, ran toward the flower ship and removed the cage from it. A patrol vessel darted forward, and the cage was put aboard. The men climbed over the railing, and the boat darted toward Clane.

As it reached the death perimeter, there was a puff of flame. Where the boat had been, a haze of ashes settled slowly toward the ground.

"Next!" said Clane implacably.

There was a pause, and then an angry shout from Calaj. "Hypnosis," he yelled at another group of men. "Pay no attention. Go in there and get him."

The men hung back, but their officers seemed in some curious way to have accepted Calaj's explanation. Savagely, they ordered their men into patrol boats, and, being Linnan officers, they climbed in with them. Whatever blindness afflicted them, it had nothing to do with lack of courage.

This time two boats came forward, and were destroyed in that instantaneous fashion.

Clane spoke through his loudspeaker hookup into the silence: "Traggen, the atom gods will continue to defend me against all the attacks you can mount. If you want to save your legion, try to convince his excellency that I have no control over this tragedy. I can merely warn you that the gods themselves will protect me against anything that you and he and all the foolish people who raised him to power can do against me. Take heed!"

Calaj must have heard, because he shrilled: "The army will attack in one group. We'll overwhelm this traitor's hypnotic tricks."

To Clane, it was a dismaying command. He had hoped that even the boy would realize the futility of further attack. But apparently that was too much to expect. Now, it was up to him to choose between Calaj and the army. The repercussions that would follow if he were actually forced to kill the youth were unpredictable. It might seriously slow down the pattern he had set himself for taking over the government.

At the moment, one possibility remained to be explored.

He settled himself at the weapon control board of the Riss liftboat. The aiming devices spun and pointed as he manipulated them with the deftness of much practice.

A spume of blue flame gashed the grass beside Calaj's gorgeously beflowered craft.

Through his microphone, he called derisively, "Your excellency, does it feel like hypnosis when it's this close?"

The grass was burning. Even from where Clane watched, the soil looked fused.

In the flowery float, Calaj climbed to his feet and lazily walked to the side of his craft, and looked down at the flames. Then he raised his megaphone.

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"You just have to look at them," he said, "and they disappear." His voice went up: "Attack the traitor!"

It was a rather magnificent bluff. Somehow, out of the depths of confusion that was in him, the boy had dredged the outer appearance of confidence that no leader could be without if he hoped to operate with a field army.

Carefully, Clane aimed. The side of the craft opposite Calaj flared with a ravenous fire. The heat must have been terrific, for the two pilots tumbled out of their seats, and dived over the front of the boat. Their clothes were smoking.

Calaj cringed, but did not immediately budge. Clane was shaken. His hope of an easy solution was fading; and the Lord Adviser's bravery was having its effect. If Calaj were killed now, he could well be regarded as having died a hero's death.

Clane hesitated. The next step had to be the decisive one. If he aimed even a few feet too close, Calaj would either die or be desperately injured.

Clane spoke into his microphone: "Calaj," he said, "I suggest that you suddenly decide it isn't hypnosis, and say that further action must await study of the situation."

The suggestion was fortunately timed. The fire was spreading. Most of the flowers at the front and side were burning, and the flames had caught firmly on what must be a wooden deck. A gust of smoke engulfed Calaj, and there was evidently heat in it, for he retreated a few feet, and began to cough just like any person breathing smoke instead of air.

He made the mistake, then, of putting a handkerchief over his mouth. And that seemed to convince him that his bluff could not be carried on.

With surprising dignity, he lowered himself over the side of the boat, walked clear of the fire—and arrogantly motioned Traggen to come to him.

There was a brief consultation, after which Calaj climbed into one of the colorful patrol boats that had accompanied him. The machine took off, and headed towards the distant line of spaceships. Traggen called over the commanders of the nearest groups of soldiers, and there were more consultations, after which the officers rejoined their units.

The army began to withdraw. In about an hour and a half there was not a man in sight. Just before dusk the first spaceship took off. One by one the others followed. In the gathering darkness, it was hard to decide just when the last ship departed. But one thing seemed clear. The battle was over.

He had thought the problem of Lilidel and Calaj was over also. But when he reached the house he found disaster. A stretcher had just been carried up to the patio.

On it lay the corpse of Madelina.

XXV.

In death, she looked like a young

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girl asleep, her hair slightly dishevelled, her body slack, her arms limply cradling her head.

Clane looked down at her, and felt something of his own life go out of him. But his voice was steady as he asked, "How did it happen?"

"In the refugee village, half an hour ago."

Clane frowned over that, and it was several seconds before the reason for his puzzlement struck him. He said then, "But what was she doing down there?"

"A message came up inviting her to come and see a new baby."

"Oh!" said Clane. And though the other's voice went on, he heard nothing more for a time.

He was thinking drearily: *Of course, that would be the method.*

The Mother Madelina, the chatelaine of the estate, the lady bountiful—into all these roles Madelina had channeled her intense emotional nature. And the astute Lilidel, gazing from afar through the eyes and ears of her spies, had realized the potentialities. A frontal attack to distract *his* attention, and if that didn't work, at least she would have struck one deadly blow. Or perhaps the attack on him had been Calaj's idea, and Lilidel had merely utilized the opportunity.

He grew aware again of the voice of the guard's captain making his report. "Your excellency," the officer was saying, "she insisted on going. We took all possible precautions. Guards went into the house, and found the woman, her husband and the baby. When the Lady Madelina entered the bedroom, the mother of the baby said, 'Do we have to have all these soldiers in here?' Immediately, the Lady Madelina pushed the guards into the outer room, and closed the door. She must have been stabbed the moment the door was closed, for she uttered no cry. She died without knowing it."

"And the assassin?" Clane asked drably.

"We became suspicious in less than a minute. Some of our soldiers broke open the door. Others ran outside. The murderers were very skillful. The husband had gone to the back of the house where there was a patrol boat. The woman must have climbed out of the window. They were out of sight before we could commandeer another boat, or reach any of our own ships. The pursuit is already on, but I shall be surprised if it is successful."

Clane doubted it, too. "Have they been identified yet?"

"Not yet. But they must have been refugees, planted in the village for just such a purpose."

He had the grave dug on the hill where Joquin, his long dead tutor, was buried. On the headstone was engraved the epitaph:

MADELINA CORGAY LINN
Beloved Wife of Clane
And Mother of Braden

After the burial, he sat for a timeless period on the grass beside the grave, and for the first time con-

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sidered his own responsibility in the assassination. He could have taken more precautions.

He abandoned that line quickly, for it was fruitless. One man could do only so much.

His final conclusion was simple: He was back in Linn, with all the deadly intrigue that implied. In spite of all his skill, Lilidel and Calaj had successfully worked an old trick on him. They had done so on the eve of his attempt to take over the government.

There seemed nothing to do but carry through with the plan.

Lord Clane Linn set up his headquarters in a village. The village was located a mile from the outskirts of Golomb, the town where the government had taken refuge.

He established his office in a large one-story house that sprawled comfortably back from a little dirt road. There were tall trees around the house, and in their shelter many tents were swiftly erected. A huge barn at the back of the house was big enough to hold numerous small aircraft.

On the other side of the dirt road was a many-storied inn with a capacity of more than a hundred people, and dining room space to feed hundreds.

Clane set up a night and day patrol of Riss liftboats. With their terrific fire power they dominated all approaches to the village.

Guards patrolled the fields and roads. Clerks in great numbers began to arrive the first day, and each day there were more of them. Mostly, they were from his own estate, but some were hired locally. By the second day, he had organized a pool of a hundred messenger craft, and he was ready to start work.

From the beginning he made literally no mistakes intellectually. His tremendous experience stood him in good stead. On the level of action, he did the right thing almost automatically, almost without thinking.

Physically, it was a different story. He was tired all the time.

He ignored the symptoms. He forced himself to prolonged effort.

And on that second day he wrote one letter, and dispatched a hundred copies of it over the planet to men who had been his leading supporters. His words were friendly but firm. He suggested that all those in authoritative positions submit copies to him of any reports they made to the government, and that they pass on to him all official orders or documents which they, in turn, received.

His letter contained no direct suggestion that he was usurping the function of the government, but the implication must have been plain. Within a few hours answering messages began to arrive from the nearest provinces. Nearly three quarters of the replies were statements of unconditional allegiance. The rest took the same attitude but more cautiously.

Before night of that second day several score great men came personally to congratulate him on his

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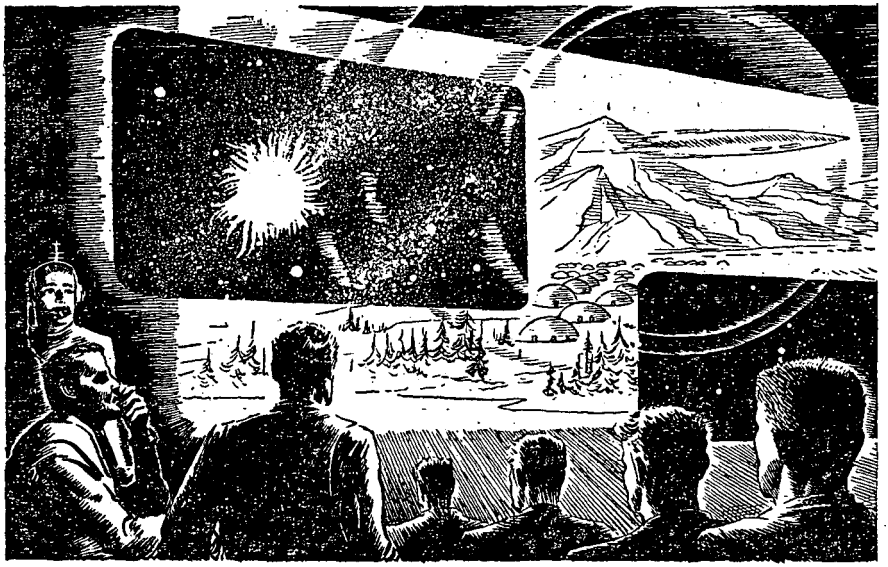

action, and to swear that they would support him to the death.

Hour by hour the excitement and tension mounted. Clane retired late, and though he fell asleep almost immediately, he dreamed strange, terrifying dreams of his childhood. All through that long night, he tossed and turned restlessly. And in the morning he wakened with the feeling that he had not slept at all.

He emerged from his bedroom, feeling worn out even as the long day began.

He found that messages had poured in continuously throughout the hours of darkness. These were from the more remote districts. From the number of them, it seemed to Clane that each person to whom he had written must have advised dozens of other supporters in his territory.

By mid-morning the avalanche of messages made it necessary to take over part of the inn, and hurriedly to fly more clerks from his estate.

Clane ate lunch with a sense of victory. From where he sat at the window of the inn restaurant, he could see men coming and going, and converted pleasure and military craft flying low over the trees. It seemed as if every minute a machine was landing or leaving.

Here and there makeshift buildings were being hastily put up, as able administrators took *all* the necessary steps to fit themselves into the pattern of his actions.

Shortly after lunch, Clane sent out his second letter, this time to gov-

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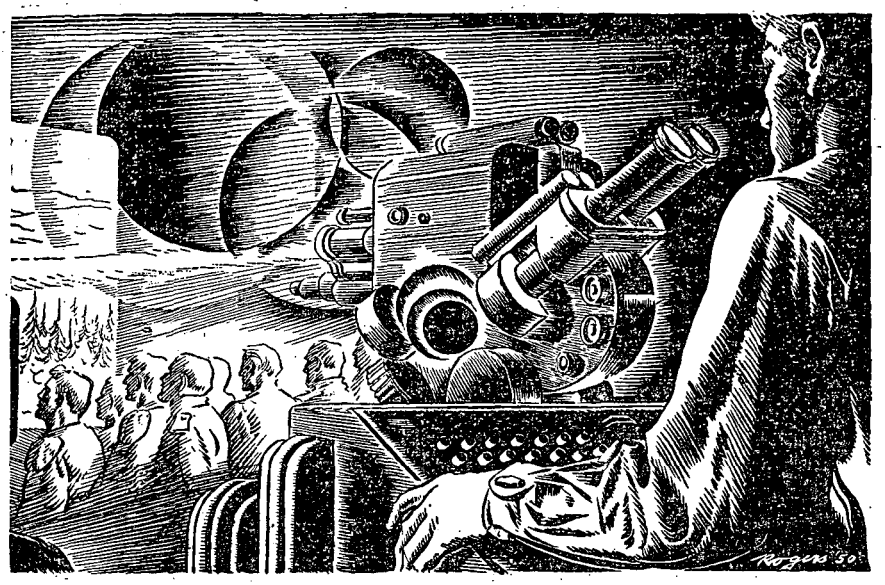

ernors, government officials and important personages who had not previously supported him. It was differently worded than the first. Coolly, curtly, he advised the recipients of the location of his headquarters. He ended his note with the directive:

> Please be advised that duplicates of all documents which you submit to Calaj must in future be sent to me. You will also forward any messages or documents which you receive from the Calaj government, after first taking a copy for your own files.

The implications of that letter would not be lost on astute individuals. Hundreds of cautious men would size up the situation and act according to their private interests and beliefs.

The response was astounding. Within two hours not only messages but the men themselves began to arrive. Patrons, governors, military commanders, staff officers, government officials—all the rest of that day and throughout the evening, Clane's small headquarters was jammed with men eager to switch their allegiance now that they were certain there was someone to whom they could switch it.

Clane went to bed that night, more exhausted than he had been at any time since Madelina's death. But the question, the doubt, that had been in his mind for so many years, was answered, was resolved.

He had struck the spark, touched the vital chord. And men had responded—as he had hoped they would.

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It was time. Oh, but it was time. It was a quarter of twelve for the race of man.

But they *had* responded. He slept tensely. And woke wondering if he would have the strength to do the ten thousand things that still had to be done. In a few, brief years all these human beings must learn to accept their great role in the stellar universe.

The parade of new supporters through his office resumed shortly after dawn. As the overcrowded conditions increased, a famous Patron suggested that Clane transfer his headquarters to Golomb into a government building of more suitable size. "It will be easier that way," he urged. "There, liaison has already been established between the various departments."

Clane agreed, and announced that he would make his move the following day.

By mid-afternoon, some of the strain was off him. Ranking officials set up offices for the sole purpose of receiving new men and assigning them to their duties. It was a task which Clane had handled almost singlehanded until then.

He began to receive reports of Lilidel's bewilderment at the way government men were disappearing from the official residence. Just when she had her first inkling of the truth, Clane did not discover. But he was not too surprised when she turned up in person on the fifth morning, less than an hour before he was due to make his move to Golomb.

The man who announced her said cynically, within her hearing, "Your excellency, a woman who claims to be your sister-in-law wants to see you."

It was a cruel remark, particularly since the man who uttered it had transferred his allegiance only the day before.

"Send her in," was all Clane said.

The woman who staggered into his office was but vaguely recognizable as Lilidel. Her face was blotched. Her eyes were wide open, too wide; and the skin around them was discolored as if she had spent a sleepless night. She was furious and terrified by turns.

"You mad man!" she shrieked. "How dare you try to take over the legal government."

The phrase obsessed her. She and Calaj *were* the "legal government". It was all she could think of, and it was not until she was persuaded to sit down that she grew calm enough for Clane to disillusion her. She listened to his words with the visible fright of a person who was being sentenced to death.

Gently, Clane explained that in a crisis governments fell because they could not help themselves. "Sometimes," he went on, "when a weak ruler does not interfere too much with the power of efficient subordinates, his government can survive a minor storm, but in time of national danger an inadequate government tumbles like a house of cards."

Towards the end of his explanation, she must have stopped listening,

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for she began to shout again, about what she was going to do to the traitors.

"I've ordered Traggen to execute them all," she said in a voice that trembled with the violence of her fury.

Clane shook his head, and said quietly, "I also sent an order to Traggen this morning. I ordered him to bring Calaj here to me, alive, today. Let us see whose command he will obey."

Lilidel stared at him for a moment. Then she shook her head wonderingly and mumbled, "But we're the *legal* government."

Her next action indicated what she thought Traggen's choice would be. Her eyes closed. Her head sagged. Slowly, she crumpled to the floor at Clane's feet.

Calaj, when he was brought in late in the afternoon, was insolent. He sat down in a chair. He leaned back. He said, "Do the gods still love me, uncle?"

Clane was fascinated. He had watched such one-sided growth as this before. It showed how human beings responded to a new environment. For nearly three years, Calaj had been nominally Lord Adviser. With the possible exception of Lilidel, the people who had put him in power had all planned to use a naive youth for their own purposes. How desperately they had been mistaken.

Clane wasted no time on the young monster. He had already sent Lilidel to a rest home that he maintained in a remote province. Now, under escort, he sent Calaj to join her.

Their seemed no limits to the work that had to be done. The reports that came in, even when abbreviated for him, took time to read and time to understand. Gradually, however, even as he grew progressively more weary, the overall picture emerged.

From all that he could gather, the first phase of the Riss invasion was over. The arrival of a second horde of colonists, he was convinced, emphasized that the second phase was due to begin. It would be remorseless. It would be aimed at every large community. Ships with resonators need only fly low over the land, and men would die by the millions.

Therefore—attack the Riss.

But he had caught a chest cold, which he seemed unable to throw off. Feeling sicker than he cared to admit, Clane headed for his estate. He settled down for what he intended to be a brief rest.

It seemed the worst thing he could have done. He coughed steadily, and almost choked with phlegm. His head ached until he could hardly think. At times his vision grew so blurred he could see only with the greatest difficulty.

It became impossible for him to retain solid foods. He was forced on a diet of liquids only. On the evening of the second day, sicker than

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he had ever been before in his life, he went to bed.

He was still convinced that all he needed was rest.

This, Clane told himself shakily, *is ridiculous.*

It was morning of his third day abed. Through the open window he could hear the sounds of men working in the garden. Twice, during a period of minutes, a woman's musical laughter floated in on the still, sweet air.

His eyes ached, his body felt feverish and chilled by turns. He was miserable to the point of not caring what happened to him. He had the vague feeling that he had made a mistake in coming back to the estate; the *Solar Star* would have been a better haven. Better equipped, more trained chemists. Something might have been done for him.

The idea never came into sharp focus. It was just something he should have done. All he could do now was sweat it out.

He had a passing thought: *The trouble is, I've never been sick before. I've no experience. I didn't realize that disease weakens the mind.*

He stirred wearily, lying there in the bed. *I've got to get well,* he urged himself. *I'm the only one who can drive the Riss from Earth. If I should die—* But he dared not think of that.

Wryly, he pictured himself; the despised mutation risen to the greatest office in the empire of Linn. And in the hour of victory against a deadly enemy struck down into his bed. Here he was, held helpless by a weakness within his own body greater than any power that he could ever wield outside.

And the victory was fading, slipping, evaporating, with him.

Shaking his head, very dispirited, he turned on his side and went to sleep.

He dreamed that he was a child of four back in the gardens of the Central Palace in the days of the Lord Leader Linn. And that he was being chased by the other children. In the nightmare, his one hope was that he would be able to control the sphere of energy before they could catch him.

The sphere, symbol of stupendous power, the almost godlike sphere—

Even in the dream he knew that both spheres, the one Czinczar had returned to him and the one they had taken from the little men, were far from the estate. And yet, as he ran in breathless terror, he tried to bring the sphere under his control. His mind seemed incapable of forming the cue thought.

The boys were closer. When he looked back, he could see their glittering eyes, their lips parted eagerly. Even their savage shouts floated out to him across the years, and echoed in his mind with all the old impact.

And then, just as their outstretched fingers snatched at him, just as utter despair seized on him,

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he spoke aloud the cue word for the sphere.

He woke up, perspiring with fear, but almost instantly he slept again. And once more the boys were after him. He realized, simply, that he had been wrong in trying to say the cue word. What he really wanted was to get to the black box that normally contained the sphere.

He reached it, and ecstatic with joy, started to climb into it. He knew—somehow he knew—if he crawled inside, the other boys would not notice him. He snuggled deep into the box—it was deeper than he remembered it—and he was sinking into a curious shadowless darkness when he thought sharply: *What am I doing here? Where is this leading me?*

Once more he woke up, more calmly this time. He thought with a bleak objectivity, *In that dream I chose death as an escape.*

For a long time, he pondered the implications. And then, very slowly and painfully, he pushed the covers aside. He sat up, nauseated but determined. *Sick or not,* he thought, *I'm getting up.*

He would go aboard the *Solar Star.* In the great chemical laboratories of the ship, he had during the long voyage found time to mix some of the drugs described in some old medical books he had found. He had tried them out first on the obviously dying, then cautiously on the sick. Some of them had been remarkably effective against respiratory diseases.

A nurse came into the room. He looked up at her blurrily. "My clothes," he mumbled, "bring my clothes."

"Your excellency," she stammered, "you mustn't. You're sick. You must get back into bed."

She didn't wait for a reply. She hurried out of the room. A minute later, the estate physician came running in. He rushed over to the bed, and Clane felt himself shoved irresistibly onto his back. The sheets were drawn up over his body.

He protested with a momentary fire. "Doctor, I want my clothes. I've got to go to the ship—" His voice faded to a mutter.

Above him, the blurred figure of the doctor turned to the blurred figure of the nurse. "Ship," he says. "What does he want to do? Get into a fight."

There was a pause. Then the doctor spoke again, "Nurse, bring in the other women, and give him a cold bath. I think he needs a shock."

The water felt vaguely numb, as if it was not quite reaching him. He accepted the sensation passively, but he thought with a measure of sardonicism: *I'm caught here. I can't get away. They'll watch me night and day. They know all the petty cunnings of an invalid. And somehow at this eleventh hour my rank means nothing.*

He couldn't remember being carried back to bed, but suddenly he was under the sheets again. They felt heavier now, as if more weight had been added. He wondered if they were trying to hold him down

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by sheer load of blankets. Above him, one of the nurses said:

"He's asleep. That's good. I think he'll be better when he wakes up."

He didn't feel as if he was sleeping. Nor was he exactly in a dream. He seemed to be standing on a green lawn, and curiously Madelina was there beside him, smiling and saying, "I'll be good for you. You need somebody like me."

He remembered that with a faint smile. His smile faded, and he turned and said to Jerrin, "I'm afraid this means that Czinczar is the next Lord Leader. The Linns are going down. All the struggle was for nothing . . . nothing—"

Far away, somebody said, "The Patronate has been advised. A Council of Nine has been set up to govern the empire—"

He was alone on the green lawn, walking in the fresh air, breathing deeply. There was a forest ahead, with shadows under the trees. Figures flitted from bole to bole. He seemed to recognize them, and yet he couldn't decide who they were.

He came to the edge of the forest, hesitated; and then, aware of Madelina close behind him, walked on into the shadows.

He awakened, and opened his eyes.

It was as if vistas had sealed shut, fantastic depths receded behind him. He felt relaxed and at ease. His vision was clear, his body cool and comfortable. Clane turned his head. Czinczar, haggard and hollow-cheeked, sat in a deep chair beside the bed. The sight of him shocked the beginning of memory in Clane. He remembered that drugs had been brought him from the ship.

He lay in bed, well but weak. And he said to Czinczar, "How long did it take?"

"Eighteen days."

The barbarian smiled wanly. "We had to fight our way in here," he said. "When I heard that you were dying, I sent an ultimatum to your doctor. When he didn't answer, I came down with three of your trained pharmacists, and an army. Since all your resonators were from the ship, and tuned to us, we just moved in."

He broke off. "How come you had such a stupid ignoramus around? After the medical work you did on the ship coming back here—"

Clane was apologetic. "I'd forgotten he was around here. I was so busy when we first came back. Besides, I was ill and lacking in sense."

A thought struck him. He stared at Czinczar with a sharper appreciation of the implications of the barbarian's presence. Here was a leader schooled in bloodthirsty tactics. And yet he had come selflessly to help his chief rival for power in the solar system.

Czinczar seemed to realize what he was thinking. "Your excellency," he said grimly, "for eighteen days I have kept a vigil beside your bed because I have no better answer to the problem of the Riss than all the fools of Linn—out there." He ges-

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tured sweepingly with one hand. He went on, "It seems incredible, but the human race can only be saved by one man, and how *he* hopes to do it I cannot even imagine."

He paused. In a curious way, he looked so tense that Clane was electrified. The barbarian nodded bleakly. "You're guessing right," he said. "The Riss war is on. And already, all the old plans I had for resisting them are beginning to look like the stupidity of a diseased mind."

He broke off. "For six days," he said simply, "hundreds of Riss battleships have been attacking human settlements of every size. I couldn't even estimate for you what the losses have been. Men and women and children are dying in agony. Unquestionably this seems to be the second and last phase."

Once more his tone changed. "Your excellency," he said harshly, "we must wipe out these monsters to the last individual.

"No!" said Clane.

He sat up slowly, conscious of his weakness. But his eyes met the other's bloodshot gaze steadily.

"Czinczar," he said, "tomorrow morning we drop a picturized ultimatum giving the Riss a month to get out of the solar system, and to accept the sharing idea as a permanent policy."

"And if they refuse?" There was a sharp doubt in the barbarian's voice. He added a protest, "Your excellency, in one month, fifty million people will be—"

Clane went on as if he hadn't heard: "Beginning about two days from now, we start destroying their forces and their civilization everywhere. The exact time depends on how soon I can get up."

He shook his head savagely at Czinczar. "Don't get alarmed. I've never felt saner. I'm ready and in position at last. I tell you, my friend, I see things that no man or brain has ever seen before. All the preliminary tests have been made, although I've still got to take some special electronic photographs."

"And then what?"

"A part at least of the innermost meaning of matter and energy will be revealed."

XXVI.

For a minute after he entered, Clane was unobserved. He took the opportunity to look over his audience.

It was a distinguished assembly gathered there in the great physics laboratory aboard the magnificent—formerly Riss, now Linnan—warship, *Solar Star*. The Temple Scientists present looked bright and clean in their white dress robes. Government officials were amazingly well garbed; they were top men, of course, and would have control of available materials.

Of all the guests, the great nobles looked the shabbiest. Their estates had been virtually taken over by hordes of refugees, and it was the common practice during the crisis to maintain an appearance of equal

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suffering. For some reason, as Clane had observed during the barbarian invasion, this seemed to satisfy the landless, the moneyless and the witless about equally.

People were suddenly observing him. The babble of conversation died. Lord Clane hesitated a moment longer, and then walked through the cordon of soldiers who had been assigned to protect the line of machines from curious visitors. He switched on the power in the all-energy microscope, the all-energy camera, and the other instruments that would be brought into play. And then he turned to face the guests, the last of whom were settling into their chairs.

Clane motioned the porters to bring forward the sphere and its container. When it had been set in its proper place under one of the glistening machines, he pressed a button. A television camera poked into the sphere as it rolled by, then moved backward and forward in perfect synchronization with it.

He flicked his hand over another switch; the lights went out. A huge screen glided down from the ceiling. On it appeared the stellar universe. Clane indicated the faintly glowing sphere to the right of the screen, rolling back and forth. "The scene you are gazing at is inside this," he said.

The idea must have been too new for them to grasp. Or perhaps they rejected his explanation even as he finished speaking. Nobody seemed surprised, which was not normal.

He waited till the stability of that blazing mass of stars had been established. And then, simply by thinking it so, started the entire mass into motion past the camera. At first the movement was not apparent. And then, a blazing sun swept toward them. It grew vast on the screen, and then swiftly began to slip by. A planet, tremendously nearby, touched the edge of the screen, and rolled in closer majestically. In the distance, a moon was visible. Clane identified them.

"Our earth and our moon," he said, "and that was our sun. Let's bring them into the room, shall we?"

He didn't expect them to understand that. He shut off the camera, waited till the screen was dead, and thought for an instant. There was a collective gasp from his audience. A blazing white ball about three inches in diameter flashed into view, and moved over under the microscope viewing lens. The room was abruptly as bright as day.

Clane said into the deathly stillness that followed the gasp, "Although it is hard to realize, this is our sun. Although it's impossible to see them with the naked eye, all the planets are with it. Mercury, Venus, Earth, Mars, Jupiter, and so on."

He waited, and a man said in a strained voice, "But how is that possible? We're sitting here in a ship a few miles *above* Earth."

Clane did not answer. For this was one of the basic secrets of the

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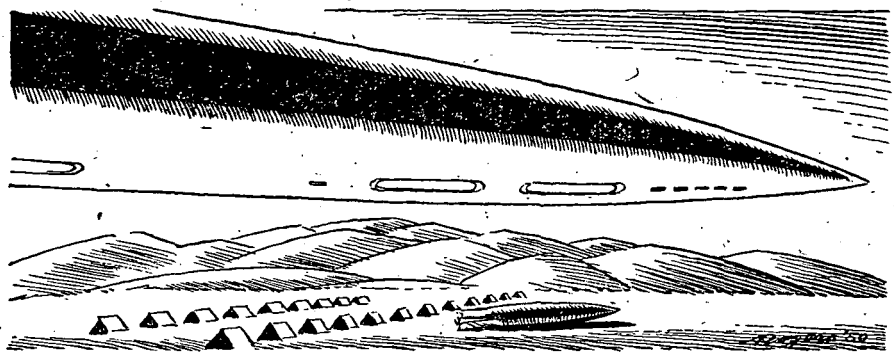

space-time-place continuum. The Riss had isolated a by-product in their "protector" device with its resonating energy flow, that intruded momentarily into every space-time field.

But here in the sphere and *its* by-products must be an answer closer to the final reality than any that had ever been dreamed of.

A rational cosmology? Surely, for the first time in the history of life, people were gazing into the deeps of the meaning of things. Which came first, thought of the Universe, or the Universe itself? The answer must be intricately interwoven into the very nature of things. Size, speed, space, *place*—all are in the understanding, not the reality. A dead man has no awareness of either. A living man can gaze a billion light-years into darkness at galaxies speeding off into still greater "distances". But he cannot easily adjust to the fourth dimensional understanding that will make it possible for him to comprehend the entire universe as a momentary thought in his own mind. It would have no size other than his own estimate, no speed except in relation to himself.

"And now"—Clane turned—"we have here an earth the size of a grain of dust. That's quite big. With an all-energy range microscope we can enlarge it hundreds of millions of times. That will give us a vast globe to look at, which we can only hope to see in small segments."

He was aware of scores of eyes watching him as he bent over the instrument. He made the necessary adjustments, then straightened, and said:

"I've fitted the machine with an infra needle, which I can describe to you only by giving you some meaningless figures. The Riss used them to pierce objects of one-ten millionth of a millimeter. I shall use it as one might use a stabbing knife."

He paused to let the mystifying words sink in. Then he said, "Now, I bring our tiny sun and its planets into position, where the microscope can be concentrated on Earth."

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He peered into the instrument's eyepiece. Without looking up, he said, "I can see Earth below. It does not appear to be spinning, and yet its speed of rotation must be about twelve thousand a second. That would be in proportion to its size. I haven't figured it out, because what I intend to do will depend on automatic machinery.

"The fact that thousands of twenty-four hours days seem to be passing every second is an appearance only. There is an unbreakable relationship between ourselves and that Earth. The timing will be exact."

He went on, "You may ask, how can I possibly hope to see anything on an object moving at that terrific speed of rotation. Especially since it's making thirty circuits of the sun every 'second'. My answer is that the Riss have supplied us with all the necessary automatic devices. It's a matter of synchronization, impossible for the human mind, but simple for energy circuits. I did a little practicing on the Moon yesterday just to make sure that the theory was sound."

He straightened, picked up a pile of photographs, and carried them to the nearest person. "Start them around," he said.

He ignored the oh-ing and ah-ing that started almost at once. Back in front of the towering microscope, he picked up the thread of his explanation.

"Speed is of little or no account when these relays are in action. This Riss camera takes millions of pictures a second. The pictures are not photographed on film, but are stored in a tube. And the way they can be used goes something like this:

"Yesterday, as you may recall, we visited the mountain cities, and looked down on them, one after another, from a safe distance. What you don't know is that I took photographs of each one and stored them in the tube."

He had been peering into the eyepiece as he spoke. Now, once more he straightened. "At this moment, the camera is taking pictures of Earth every time it passes underneath. When I press home this lever, it will take pictures only of the area of that tiny globe which compares in structure to one of the photographs I took yesterday of a Riss-controlled city."

He pressed the lever.

A shield slid between the brilliant sun and the audience, effectively dimming the screen. There was an area of brightness on the screen.

"Ah, I see it's not quite in focus," said Clane.

He made another adjustment. The result showed immediately. The bright area on the screen cleared, and became a city in a mountain setting.

A bass voice said, "Why, that's Denra."

"I thought," said Clane, "I'd give us all a ringside seat for the show."

And still, he realized, from their faint reaction, they had no idea of

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what was coming. It was no wonder; he had to admit that. They were witnessing the co-ordination of Riss and human science at its highest level—and they simply didn't have the background to grasp the stupendousness of what was about to happen.

Inexorably, he went on, "The next step is to synchronize our stabbing 'needle'. Please realize, all of you, that when used against an earth the size of a dust mote, the thrust of a 'point' one ten-millionth of a millimeter in diameter could be disastrous. The instruments must be set, accordingly, to strike a surface blow only, like this—"

On the screen, the city of Denra dissolved in a cloud of dust. Part of a mountain was indented as by a colossal hammer to a depth of about a mile.

"The beauty of it," said Clane in an even, remorseless tone, "is that there is no radioactivity, and no counterattack possible. Now, obviously we're not going to destroy our own cities unless we have to, even though they are occupied by the Riss at the moment. I think we should give the invaders a chance to think over what has happened, while we switch to another city, this time not on Earth but on the Riss planet the *Solar Star* visited. I took the necessary photographs while we were there, because even then I was thinking along these lines."

It required about a minute to bring that sun and its planets out of the sphere and under the all-energy microscope.

Clane said, "As you know, our terms have been broadcast. We used a series of pictures to tell our story. We require surrender of half the battleships that came to the solar system, co-operation in our galactic peace program—which includes mutual development of all newly discovered habitable planets and a partial sharing of many worlds already inhabited. The interstellar television mechanism, transferred from the second ship we captured, is aboard and in operation—unfortunately, the second ship itself is still out of commission. So far we have received no reply to our ultimatum. It therefore becomes necessary to convince a stubborn enemy on part of his home territory that he must co-operate or die."

He touched a button, and the Riss city on the screen dissolved as if it were made of powder. The blow seemed harder than the first one, for not only was the city squashed but the great mountain beyond it ripped apart like a piece of cloth.

"I'm setting now for an even deeper thrust," said Clane. "The reason is that we 'photographed' Riss controlled cities only on Earth and on the one Riss planet we visited. Any blows we deliver against other Riss planets marked on the captured star maps will have to be made in haphazard fashion, that is, without benefit of a preliminary 'photograph'. I think we can always hit a mountain area, but we must strike hard

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enough so that the effect is felt violently a hundred miles away—"

In spite of his will to calmness, his voice faltered. His audience was deathly silent, but the members could not possibly realize, as he did, the vast scope of what was happening. The Universe was tamed. Man need never again look out at the stars and feel small and insignificant. The grandeur of space-time remained as great as ever, but the veil was lifting. The days when the very mystery and size overwhelmed the wondering minds of those who gazed were not past. Yet surely it would never again be quite the same.

Clane covered his own feeling of awe by taking his time with the preliminaries to the next blow. Finally, feeling himself under control again, he said, "I imagine it will take time for them to accept the bitter reality of their defeat. We'll just have to keep on punishing them till they signal us that they are prepared to discuss terms."

Four hours went by before that signal came.

A year had passed. As he walked beside Czinczar, Clane said, "It still looks ugly to me."

The two of them, Clane in a drab priestly gown and Czinczar wearing the uniform of a private in the barbarian army—a common sight around Linn these days—walked slowly up to the newly finished victory column.

Clane studied it. It stood in the great square before the Central Palace. Its construction had been voted by the Patronate, and it consisted of an enormous cube of marble on top of which an intricate scene was arranged. A man in the gown of a temple scientist stood astride two planets. High above his head, he held a third planet in his hands. He stood on his tiptoes as if reaching for something. All around his feet were other planets and some star-shaped objects.

The gown, unlike anything Clane had ever worn, was a bright gold in color. It gleamed in the afternoon sun.

The figure bore a rather striking facial resemblance to Clane, but the body was huge out of proportion to the rest of the statuary. A giant towered there.

Clane turned to speak to Czinczar, and saw that the other was watching a couple that had paused a few feet away.

"Look at that," said the man to the woman. " 'Savior of the race', it says there. What will these ruling families think of next?"

The woman said, "Are you sure it's a member of the ruling family? Oh, there's the name up there." She moved her lips as if she were reading it to herself. Then she said, "Clane Linn. Which one is that?" They drifted off in the direction of the palace.

Clane said dryly, "Such is fame."

He saw that Czinczar was smiling. The great man was smiling. "It's a big world," he said. "Why

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should they know your name, or what you look like? They didn't see you do anything. Perhaps when we get a wider distribution of television, you may be recognized on every street corner."

Clane said, "I'm not arguing with you. How much thought do I give to the great men of the past? I'll divide that by ten, and assume my proper position in the hall of fame." He added, "It's good that men forget their heroes and their gods. If they didn't, life would be drab indeed for the newborn."

Czinczar said, "I'm sorry I couldn't get here in time for the unveiling. Let's sit down for a minute."

He motioned Clane to one of the hard stone benches. Presently a group of laughing girls came by. They did not even glance at the column, or at the two men who sat beneath it.

Two young men carrying artists' palettes and easels unfolded their equipment and sat down on benches across the walk from the work. They began to paint.

"What I like about it," said one, "is the way it silhouettes against the sky. If I can blur it in properly in the foreground, I think I can make a wonderful cloud scene.

"It's an atrocious work of art," said the other, "but statuary pictures have a fairly steady sale. When a new one comes along, the important thing is to get at it first. If I can place a dozen copies in the best shops, I'll have orders for hundreds of them."

They fell silent again. After several minutes, the second man came over to Clane and Czinczar. "I'm trying to draw this statue," he said, "and you two men add nothing to the scene sitting on that bench. If you don't mind, I'd like both of you to stand up and raise your right hands as if you're paying tribute to a hero. I assure you I won't take very long. I'm a fast worker, and I can sketch your likenesses in a few minutes."

He must have misread Clane's expression, for he shrugged, and said, "If you don't care to do that, I wonder if you would mind moving over to those other benches."

Czinczar glanced ironically at the Lord Leader of Linn, then he stood up. He said, "I question if my friend should pose in front of this particular statue, but I shall be very happy to do so in the position you suggested."

"Thank you," said the artist.

He went back to his easel.

THE END

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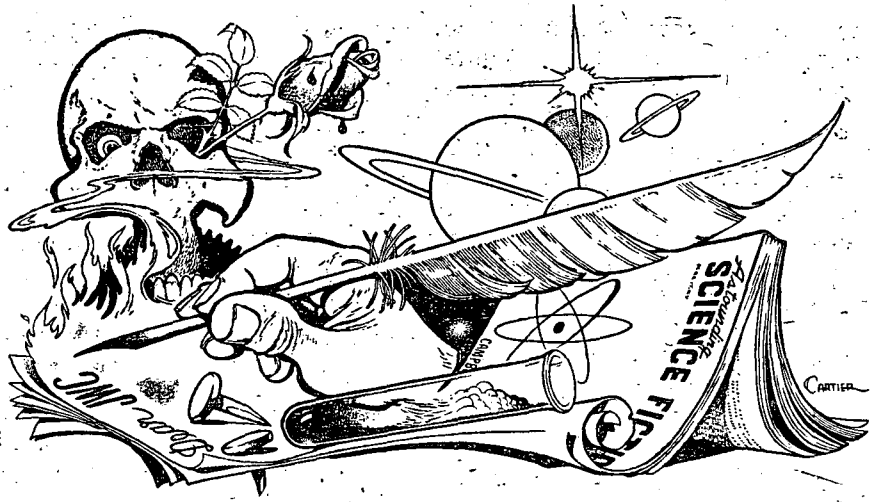

BRASS TACKS

Dear John,

Super!

I suppose that us folks that do not edit a magazine for a living haven't the faintest conception of the amount of time and energy that went into your effort to create The definite time line for this November out of a minimum probability line of last November. I'm proud to say that I spotted it at once, the title of Heinlein's yarn stuck in my crop a year ago when it was first planned, I wondered what he would do with it. I had to rush right home and determine the deviations, if any, from the plan. Authors are notably hard to get along with, you must have moved the entire planetary system to get all of them to do just what they were supposed to do. Or is that psychohistorical necessity, and didn't they have any choice?

As Mr. Hoen was able to write a year ago, this issue will be the top for 1949, unless the December issue is very good. I don't rank the stories as he did, see the lab report below, but that is a matter of choice. I see you weren't able to get back to the annual size. This change could be postponed until November 2049 as far as I am concerned.

Sorry Willy Ley's article got crowded out, but Asimov's latest more than makes up for it. I really can't think of a single issue of any SF magazine that has had a more distinguished list of authors. The only ones lacking seem to be Doc Smith and Williamson, and, after all you only have 162 pages.

The ranking, which, as I said

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differs a little from Mr. Hoen's—he might like to revise his list a little after reconsideration of the stories.

Special top ranking—see below:

First, "Gulf," by Heinlein. Excellent because there has been a tendency lately to concentrate on mind stories, where all of the fighting is done by thought waves. This is pure action, and now that Bob is back, let's keep him. Waiting for the conclusion next month.

Second, "And Now You Don't." There is nothing unusual about this but it is good. If it had been another "Big and Little" or "Dead Hand" it would have beaten out "Gulf".

Third, "What Dead Men Tell." A little off Sturgeon's track but, after all, he didn't have a free hand, a year ago, the probability was small, but it was there in the title anyway.

Fourth, "Finished." Keen competition, as Mr. Hoen has already pointed-out, put this one lower down in the standings than it normally would be.

Fifth, "Final Command." Nothing wrong with this one, either, just that the others are too good.

Sixth, "Over the Top." Imagine del Rey in last place, simply because he was in such stiff company.

Special top award: "We Hail," Don A. Stuart as the Master of Probability, for contributing and directing the energy requirements to make, as I said before, an almost vanishing fragment of the imagination into the one specific now.

I would like to say, keep up the good work, but I am afraid that this is one of those once in a millennium propositions, that couldn't be made to work so satisfactorily again. But that doesn't mean that you can keep the above mentioned authors and others from continuing to write and contribute.

This issue is a little—two months—ahead of time, but it is a fitting and very suitable twentieth birthday present to the reader.—Robert B. Griffin, Allen Road, Millington, New Jersey.

Thanks! I think all the authors enjoyed proving they could do it to title and time!

Dear Mr. Campbell:

My Underwood portable—although the latest model—is no calligraphic transcriber, such as Arcadia's, but I hope that it will suffice to convey to you my feeling of joy and satisfaction when I say that (1) the November issue of Astounding is thoroughly nutritious, and that (2) it is the *best* issue in long ages!

I herewith extend profuse congratulations and thanks to your estimable self, and to Messrs. Asimov, Heinlein, Sturgeon, del Rey, van Vogt, de Camp, and Richardson! (The hook on your editorial was very much to the point!!!).

How is W2ZGU oscillating nowadays? I have no transmitter, but—

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if you'll inform me as to your operating frequency (or frequencies)—I'll attempt some reception tests. Yours in Null-A.—D. H. Blair, P.O. Box E-5213, St. John's, Newfoundland, Canada.

W2ZGU operates mostly between 28.7 and 28.9 Mc. on VFO control.

———

Dear Sir:

How does one indicate through use of a typewriter the sound of fists frustratedly pounding a table?

Two serial stories—count 'em, two!—in the November issue make me sooo maaad.

I think it's fine that book length science fiction has now become respectable enough for the publishers' pretty paws to print. Just fine. But let's have books as such, not partial books in magazine issues. I won't touch an issue to read a serialized thing until and unless I have all copies containing all parts of said thing. Is that fair? Sometimes four months elapse before I have the pleasure of reading worth while work by talented and imaginative—artistically as well as scientifically imaginative—authors.

Books are called books because they contain completed works and magazines are called magazines because they contain completed works of shorter length than books. Please go back to editing a magazine and/or get into the book business as a separate venture but let's have no more attempts to compete.

Heinlein's "Gulf" entranced me until it stunned me with the horrible "To Be Continued" at the bottom of what unexpectedly became the conclusion of Part One.

Our library contains a copy of "Haunted Omnibus," 1937 edition, purchased in that year, as well as the "World of Null A" and includes a reasonable sample of Science and Fantasy fiction full book length and anthologized volumes printed during intervening years, so we cannot be considered Johnnies Come Lately—or After Hiroshima Fans. From comparative Old Time Readers, then, please consider the seriously offered request to quit serializing. Please?—S. A. Newman, 119 Arch Street, San Francisco, California.

But look—some stories must have 50,000 to 70,000 words for proper development. What shall I do—just reject fine yarns because of that?

———

Dear Mr. Campbell:

A slight bout with Sir Flu enabled me to miss a few classes with impunity. Cause and effect: herewith, a Lab Report on the last two issues of ASF.

November, 1949:

1. "... And Now You Don't," by Isaac Asimov. (Part I).

2. "Gulf," by Robert A. Heinlein. (Part I).

3. "What Dead Men Tell," by Theodore Sturgeon.

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Web of Easter Island—Wandrei
Fourth Book of Jorkens—Lord Dunsany
Genius Loci & Others—C. A. Smith
Porcelain Magician—Owen
Blind Spot—H. E. Flint
Spot of Life—Flint & Hall
Lords of Creation—Binder
Exiles of Time—Bond
Seven Out of Time—Zagat
Sidewise in Time—Leinster
Wheels of If — Pratt & de Camp
Divide and Rule — Pratt & de Camp
Carnelian Cube — Pratt & de Camp
Lest Darkness Fall — Pratt & de Camp
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Skylark Three — E. E. Smith
Skylark of Valeron — E. E. Smith
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First Lensman — G. O. Smith
Venus Equilateral — G. O. Smith
Nomad — G. O. Smith
Book of Ptah — Van Vogt
Out of the Unknown — Van Vogt
Masters of Time — Van Vogt
Triton — Hubbard
Slaves of Sleep — Hubbard
Final Blackout — Hubbard

Darker Than You Think—Williamson
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4. "Over the Top," by Lester del Rey.

5. "Finished," by L. Sprague de Camp.

6. "Final Command," by A. E. van Vogt.

The Foundation series has been one of the most enjoyable ever to appear in ASF, in my opinion. Heinlein just begins to get rolling in Part I of "Gulf". I felt that Sturgeon's yarn was the most original of the short stories, and "Final Command", while laudable in intention, struck me as a somewhat strained parable. On this business of robots, I might mention in passing, I hardly think that a reasonable facsimile of man can be created on mechanistic principles alone. A machine is a machine, no matter how complex you make it. You may object that the human body, too, is a machine, and life simply the sum total of its processes. I don't agree; I do not think that life can be injected into an inanimate object like so much penicillin. I am not referring to any "divine spark" but rather to some new factor that must have appeared somewhere along the line of emergent evolution. That may sound a trifle unscientific, but I would hazard a guess that it will sound less so a few years hence.

December, 1949:

1. "Gulf," by Robert A. Heinlein. (Conclusion).

2. ". . . And Now You Don't," by Isaac Asimov. (Part II).

3. "The Witches of Karres," by James H. Schmitz.

4. "A Can of Vacuum," by L. Ron Hubbard.

5. "Reversion," by M. C. Pease.

Heinlein goes to town in the conclusion of his novel; very stimulating stuff, whether you happen to agree with him or not. The Asimovean derring-do continues interesting, and the Schmitz yarn, with its UN-KNOWish tinges, was good. Hubbard's good-old-days-in-the-Space-Navy routine was hardly worthy of him, and "Reversion" was all plot and no story.

I believe that Heinlein's "Gulf" is quite worthy to take its place alongside Stapledon's "Odd John," Van Vogt's "Slan" and a few others as a successful tale on the superman theme. It is intelligent, sophisticated, and well written. There is a basic difficulty in such stories, however. It would be impossible, to all practical purposes, for a man to describe or to accurately imagine a "New" man. Consider a bright ape —no offense intended to Authors Heinlein, van Vogt, *et al*—existing without knowledge of human beings, in some long-ago—call it the Oligocene—period. What do you think his chances are of imagining someone like Shakespeare, much less telling the other apes about it in a way that they can understand?—Chad Oliver, 2508 Rio Grande, Austin, Texas.

That is and always will be the basic difficulty in writing a superman story. But remember the way it was handled in "But Without Horns" in Unknown?

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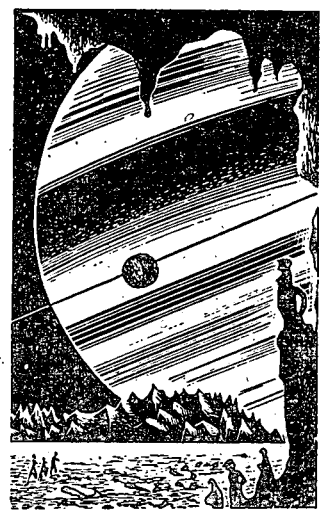

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Dear Mr. Campbell:

I feel that I must write to you, and congratulate you on the steady improvement in Astounding the last few months, culminating in the really excellent December issue. Last year Astounding was definitely in the doldrums—except for the covers which have been consistently good—but your best authors have been trickling in and now with Heinlein back, you're right in the groove again, right in the groove.

My story ratings for the December issue are as follows:

1. "Gulf," by Heinlein. Easily the best serial you have printed this year, and Heinlein at his very best, which is unbeatable.

2. "... And Now You Don't," by Asimov. I'm a sucker for a Foundation story, and this one's up to the usual standard.

3. "The Witches of Karres," by Schmitz. The perfect Christmas story. I enjoyed this one a lot, it was the sort of story Sprague de Camp used to do so well, you know, before he started writing those AWFUL Zamba things.

4. "Reversion," by Pease. Nice short. New author?

5. "A Can Of Vacuum," by Hubbard. Mr. Hubbard is one of my favorite authors, but he should leave this sort of thing to René Lafayette. 'Nuff said!

The articles were above reproach as always, the editorial informative, and a word of commendation to your cover artist.

Finally The M.H.D.O.I.F. of the year goes to Sprague de Camp for his Zamba series. The above, as any ex-Royal Air Force man will tell, means The Most Highly Derogatory Order of the Irremovable Finger, and was usually awarded when you became a German Ace.—A. J. Burch, 60 Sutcliffe Road, Plumstead, S.E. 18., England.

We'll try to make '50 good. After all, next January we attain our majority!

Dear Sir:

I found the novelette "The Witches of Karres," by Schmitz, in the December issue one of the most interesting and compelling stories I have ever read in my nearly quarter century of faithful adherence to science-fiction literature. It really stirred me to the deep. I found myself leafing through it and rereading it time after time—something I haven't done since I read a story called, I believe, "When the Atoms Failed". I've forgotten the author's name, it's been so long.

It may interest you to know that I have a collection of about sixteen hundred mags and two hundred books which I have saved with the intention of using for references in a few more years when I am retired—age 44—and can enter my workshop to give undivided attention to working out several ideas that have occurred to me over the years.

One more thing, I really do enjoy the articles regardless of subject matter, though I will confess to lean-

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ing towards the ones on calculating machines, systems, and techniques.

Again let me say "The Witches of Karres" was great!—Russel E. Mitchell, Chico, California.

Thanks! We liked it, too!

Dear Mr. Campbell:

I read your editorial, "Digital Computer," in December Astounding with some interest—*you* call it Science Fiction but I like old associations best.

It seems to me you have presented a coherent, comprehensive picture of the memory function. However, it appears to me, layman that I am, that you are not yourself entirely decided upon one point; namely, the response of the memory-circuit to the keyed stimulus. Frankly, it is not clear to me either. Yet I should like to offer a respectful difference of opinion.

You note that a reply, "No, I have never heard," implies a *complete* and practically instantaneous search of the memory-index with a positive lack of filed material. Now, this is where my opinion differs.

Let us abandon the precise denotations of science and resort to the somewhat less precise, but more graphic, illustrations of philosophy. Visualize the brain as a great cloakroom, a warehouse, in fact, outfitted with an infinite number of coat hooks. Each coat hook will accept one coat only of the infinite number

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of coats known to be in existence. Certain areas of the cloakroom are marked off for coats of a given type. Each coat of a type is different from every other of its type, but there is a strong distinguishing feature to each coat that identifies its type—color, weave, cut, number of buttons, et cetera.

Let us say there is a little man in charge of the cloakroom. He is the monitor in charge of coats. He is the part of the setup neither you nor I nor anybody else knows anything about. He is the mysterious factor that makes everything work. You show him your coat check. This is the key-impulse. He goes to *the* hook, removes *the* coat, and delivers it. He is an efficient little man.

Maybe the little man is not so efficient. Maybe he is a little lazy. Maybe he has to fish around and bring out a half a dozen coats before he gets the right one. (Slow memory.) Maybe he's so downright lazy he won't even look. He says, "Nope, never heard of it" without even checking the hook the coat should hang on.

Again, maybe he gives a glance at the proper hook and it's empty, so he mutters the same answer. The coat happens to have slipped off its hook and is lying on the floor, so he doesn't see it at first glance.

The key is in the impulse that draws the reaction. It is not conceivably possible to me that a complete check of the coatroom is made of the entire memory-file to recall every memory. The memory is either there or it is not. The *right key* will unlock the right file instantly, because it is keyed to it. Our little man knows all his keys at sight. But the slightest distortion of the key will render it useless, or at least, difficult to use.

If we could catch our little man, pin him down and get a picture of his anatomy, we would have the whole story. We cannot, so we simply let him work harder when in his inefficiency he has misfiled a piece of information, or when our own inefficiency causes us to present the wrong or a modified key to unlock the desired memory cell.

It occurs to me that in the operation of one of the so-called "mechanical brains", the key fed to the machine must possess *all* the factors of the equation to be solved. The machine cannot "think"—it cannot form abstract relationships. An adding machine cannot add 3x plus 4y and come out with a concrete answer in numerical digits. The brain, being capable of assigning values to x and y can do so.

Now, when you feed the memory-index-key to your memory circuit, how often does it contain *all* the factors that will bring an instantaneous response? Not often. Your check tells the attendant your coat is somewhere in the northeast section of the warehouse. Maybe it isn't that complete. It merely says it *is* in the warehouse or cloakroom or whatever. Only in the latter case is it necessary for the little man to make a complete check of the mem-

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ory index. And that is not instantaneous. With luck, it takes minutes or hours. It may take days, months or even years. It depends on how many coats have to be looked over before the right one is found.

As a writer, you know the value of "stewing" in the subconscious. Mechanically speaking, you have fed the component keys into your memory circuit. Your little man rushes around throwing relays, acting on the meager information furnished. Sooner or later, but ultimately, your memories are gathered into order and channeled into the conscious mind—you take your collection of coats and walk off with it.

But if your little man is lazy, you won't get any coats at all, even if they're hanging in plain sight all the time.

What most folks, then, seem to need is not a "better memory", but a more efficient tender of the memory-files. A business-office file is a marvel of efficiency, but you never see one operated efficiently by a moronic file clerk.

Your 13.6—which is no key at all to my memory index—or 3.1416—which is—is a specialized impulse, keyed directly to a certain section of the warehouse where all the coats of this type are hung. The word "mercury" in your case—pi in mine or circle—is another such key to the same section. It is a key to its own coat and to the other coats in the same area by association. In my

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memory index, "mercury" is a key to a certain area, but the hook for "13.6" is vacant. Up to the time of reading your article, that particular coat had not been checked. See? You can't remember anything that isn't there to be remembered.

But if it *is* there, you *will* remember it if you drive your little man keeper of the files hard enough and keep him at the job long enough. Memory is not instantaneous. It is just a case of the apples on top falling off the heap first when it is jarred.

In conclusion, give us more of those "Krishnan" yarns by L. Sprague de Camp. Character in science-fiction "characters" is something so seldom come by, it shines out like a polished jewel. Most writers seem so irrevocably to connect science with machines that they make machines of their people.—Manly Banister, 1905 Spruce Avenue, Kansas City 1, Missouri.

Anyway, those little men must move around on jet-propelled roller skates!

Dear Sir:

The December 1949 issue rates as follows:

Place	Story	Author	Points
1.	"The Witches of Karres"	Schmitz	1.0
2.	"A Can of Vacuum"	Hubbard	2.0
3.	"... And Now You Don't	Asimov	3.0
4.	"Reversion"	Pease	3.5
5.	"Gulf"	Heinlein	4.0

"The Witches of Karres" is indeed a delightful yarn. "Can of Vacuum" reminds me a little of Jameson's Admiral Bullard Series. "Digital Computer" is very interesting. For years the outstanding features of the magazine have been The Editor's Page, and the factual articles, especially those by Willy Ley and L. Sprague de Camp. Articles of this type give ASF a dignity not found in similar magazines.

I rate "Universe," by Heinlein, as the best story to appear in ASF in the past ten years. This story and its sequel "Common Sense" give one of the best pictures of Man and the Universe I have ever seen in print. For my money "Final Blackout," by Hubbard, is the best serial, and a close second for top honors.

I must admit to a preference for the more realistic stories, especially those based on a knowledge of Cultural Anthropology, Sociology, or History. De Camp's recent "Queen of Zamba" is an example of what I mean. Could it be that he is an Anthropologist or Sociologist?

A novelette or short story gets my vote almost any time over a serial. An exception to this is "Needle". If you must run serials, please confine them to two issues. Much science fiction, especially the serials is too inflated with words to qualify as literature. If it were shorter and more polished, it would pack a much greater punch. This brings to mind the creations of E. E. Smith. These are nothing but huge meaningless masses of words thrown at the paper! Need I say more?

One of the best stories to appear

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in the past ten years is "Emergency Landing," by Ralph Williams—July, 1940. This story covered less than three pages, but it was very well written and packed a punch. Another excellent short story is "Robot's Return," by Robert Moore Williams—1938.

Van Vogt's best is probably "The Black Destroyer"—July 1939. While I enjoyed "Slan", most of his serials left me cold. I refer to the A operas. In the May 1949 Brass Tacks Mr. Warren Carroll has a sentence that is very descriptive of these creations. "Gosseyn can save the Galaxy only with his brain, but this instrument of power keeps jumping from body to body like a demented jack rabbit." To which I add a chorus of amens.

"In Hiding" is without a doubt the best "Superman" story I have ever read in ASF. The best is "Monkey", written in the sixteenth century by the Chinese writer Wu Ch'Eng En. Another excellent story is "Late Night Final". I noticed a resemblance to this in "The Witches of Karres". Let's have more like these.

I am very interested in the Binary system of counting and its applications to computing machines. Why not call it the Dual system rather than the Binary system? How do you write such numbers as 1.2, or 1.02 in this system? I assume that 1.1 would be written 1.1 in the Binary system. For 1.2 do you write 1.10, and 1.010 for 1.02? It would

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seem that my Digital Computer is somewhat wedded to the decimal system especially to the right of the decimal point—or is it dual point?—William B. Roosa, 2215 Broadway, Great Bend, Kansas.

Binarily speaking, the decical 1.20 seems to be the repeating "binial" 1.00110011. . . .

Dear Mr. Campbell:

"The Real Pushbutton Warfare" —ASF, January, 1950—is an editorial that I won't soon forget. If enough people could comprehend its message, perhaps Homo sapien could rightly claim to be a thinking animal.

The January issue is a worthy one to begin the new year, the best all-around issue in quite a while. While rating stories is a ticklish business at best, I would give ". . . And Now You Don't" first place with "Not To Be Opened—" a close second.

Captain Netherwood's problem is interesting. My answer is: the rocket, after two hundred minutes, is 628,910 miles on the horizontal and 638,910 feet on the vertical from the starting point. Is that approximately correct?

In closing, may I say that I have been reading ASF for about fifteen years and have been unaware of the "slant" which Reader Smith detected, even though I, too, once attended The University of Texas. The important thing is the numerous fields of thought—general semantics, cybernetics, et cetera—which the writers of ASF open to us readers—B. L. Blankenship, San Saba, Texas.

You'll find the article on dianetics in this issue—and find the source of that pushbutton idea!

Dear Mr. Campbell:

As a reader of long standing, not to mention being the author of a number of "rejects", I am, for the first time, writing to point out an error in the story development in your latest publication, namely: January 1950; the story, "The Xi Effect".

The development of the universal shrinkage idea, as expressed in the story, was very cleverly done; however, in bringing forth the shrinkage through the length of the various energy levels; that above 20,000 Angstrom units, the radio waves; then the visible spectrum, the author omitted the effect of the loss of the radiant heat wave lengths.

Since these wave lengths are to be found between 7,600 Angstroms and the radio waves, their loss would be experienced long before the visible light spectrum. As a result, I feel certain that everyone in the story would have been seriously discomforted, if not frozen to death, by the removal of the infrared band, the sun's heat, et cetera. I just don't believe that there would have been but very few people around to notice that the landscape, the moon, and

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the flowers were changing color. *Tsk! Tsk!*

By way of compensation I would like to state that, if you can overlook the aforementioned error, the story was very well written and provided very interesting reading.

But, Mr. Campbell, you really should have noticed how cold it was getting! *Again, Tsk! Tsk!*—Rodney L. Cron, Ohio University, Athens, Ohio.

Hm-m-m—but no radiation of heat would roast, not freeze, Earth. The Sun's output is in the visible; the Earth's energy loss is in the infrared. Net result: slightly reduced input, output cut off entirely!

Dear Sir:

Now that Mr. Raasch has supplied you with the binary solution—ASF, January, 1950—to your multiplication problem, perhaps an arithmetical solution would interest you.

The essence of the solution is that in multiplying and dividing a product by the same number—in this case 2.—we do not change the value of the product. That is, 8x5=4x10=2x20=1x40=40, which is the answer we would get by the given system. However, in dividing an odd number by 2 we "throw away" the resultant fraction and then add to the final product the factor opposite the odd number. That is, if we were multiplying 7x5 by the given method we would set up our table like this:

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7 x 5
3 x 10
1 x 20

The solution is then given by adding 20+10+5=35. Here, the final product, 1x20, does not equal the original product, and the correction factors 10 and 5 must be added for the following reason: Every time we divide an odd number by two, the resulting product is less than the preceding product by a quantity equal to the factor multiplied by 2 in the preceding product. That is, from 7x5 we get 3x10, but 7x5=(6+1)x5=6x5+5=3x10+5. Hence the addition of the number 5 opposite the odd number 3 in our table. The table is merely a convenient way of keeping track of these operations.

I would like to see more of these problems in ASF. The readers could undoubtedly supply many if urged. As you know, the magazine is excellent, especially the well written articles—Richard L. Lander, 6630 Lucille Street, Oakland 3, California.

A sound decimal—arithmetical explanation. May be of interest to those who don't like binary systems in any guise!

Dear Mr. Campbell:

I just had to write and comment on "Not To Be Opened—", the featured novelette by Roger Flint Young, in the last issue. That was probably the best one since "In Hiding," or thereabouts. Very well handled, nice suspense buildup, and rather like "Person From Porlock," a few years back,

The story had a major flaw in one point, I'm afraid. It seems to me that the Underground people in the future would take a look at the caves, and if they were filled with weapons from the past, then there would have been no reason to send their agent back, since the supplies already existed in their present, and could not very well cease to exist. And, therefore, if they found the stored weapons *not* in the caves, then they would know the project had failed, and there would be no reason to send the agent back, since it was obvious he would not succeed.

Despite this, it was a fine story. I hope to see other ones as good, under Young's by-line in future issues. And by the way, may we expect another *Unknown Annual* this year? —Lin Carter, 1734 Newark Street So., St. Petersburg, Florida.

Look, friend—any time story is going to have that sort of hole in it! Should we drop the subject of time stories—or go ahead and have our not-strictly-logical fun?

* * * * *

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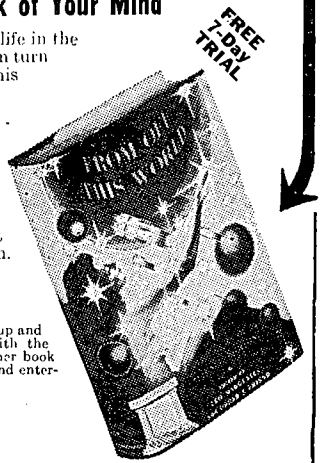

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